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THE
APPLICATIONS AND USES
OF
VULCANIZED GUM-ELASTIC;

WITH
DESCRIPTIONS AND DIRECTIONS FOR MANUFACTURING PURPOSES.

BY CHARLES GOODYEAR.

VOL. II.

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APPLICATIONS.

Of heated or vulcanized gum-elastic. Its usefulness and variety. Novelty and peculiarity of construction, and the necessity of detailed descriptions. Extent of application. The words India rubber, gum-elastic, caoutchouc, synonymous throughout this work.

IN describing the applications of caoutchouc, the writer has endeavored to confine himself to the description of such fabrics and applications only as are deemed to be of practical utility, though in some few instances articles are described which have not been tested by use at the time of writing.

Reasoning from the utility of other things like them in kind, it may be fairly presumed that they are alike useful. Where there is a doubt of the success or usefulness of any application, the fact is stated in connection with the description of the article.

Had not the writer confined himself to rules of this sort, or had he indulged in describing uses and things deemed of possible or probable utility, or even described all the varieties of the same class of articles, or enlarged upon all the ascertained uses of successful applications, it would have swelled the volume to an inconvenient size. To those who are unacquainted with the subject, or who have not seen the specimens, there are some applications mentioned, such as clothes-brushes, coal-scuttles, kitchen utensils, &c., which may at first appear ridiculous. Notwithstanding this, it may very likely be found that these are the very articles to which some of the fabrics are best adapted. In the description of the various articles, it is stated that each article is made of one or more of

the different fabrics, or of a variety of them. The writer does not mean to say, that in all cases the articles will hereafter be made of the same fabrics, and by the same methods which are at present adopted; but that thus far such fabrics are found best for such uses, and that the specimens are now made of such fabrics and upon the plan described, which in most cases, it is believed, will be found at any future time to be the best method of manufacture.

In nearly all cases where drawings are given, there is some novelty in the article, or some peculiarity in the construction, on account of which they are thought necessary to the description, in order that all may understand them. Among the applications there are included quite a number of inventions made by other individuals, for the successful operation of which, these fabrics have been found necessary. He has given the names of inventors in all cases where he has been able to ascertain them, and has placed his initials to those inventions only, which he believes to be exclusively his, omitting to do this in cases where the original ideas were suggested by others, notwithstanding that they were wholly demonstrated by himself. If the applications appear too numerous to have been made by one individual at one time, it will be remembered that the labors of fourteen years are herein summed up. This work is not made of speculative theories and specifications of things supposed possible to be done, but it consists principally of facts fully demonstrated by actual experience.

Although it will be impossible that the various markets can be supplied with many of the articles for a long time to come, yet any or all of them can be obtained by specially ordering them from the respective licensees of the inventor, according to the branches which they have severally undertaken to prosecute. It may be thought, by some, that there is an indiscriminate recommendation of the different fabrics, for different uses, but such is not the fact. It is believed that in most, if not in all cases, there is a good reason for the selection and recommendations made of particular fabrics for particular

uses, though the reasons are not always given for the selection that is made.

During the course of experiments which occupied five years, previous to the discovery of the vulcanizing process, and two years subsequently to it, new uses and applications of gum-elastic were almost constantly discovered, and the substance with which the writer experimented, was indiscriminately applied to different articles, as convenience and fancy prompted, for the purpose of testing the quality of the gum, and the success of the experiments. In this way a more thorough knowledge was acquired of the nature and susceptibility of the substance, so that when his efforts were crowned with success, and there remained no doubt that a valuable improvement had been made, and there was no longer any danger of failure from the decomposition of the gum, the inventor was well prepared to go forward and extend the applications of the improvement indefinitely, until the question came not to be, How far can they be extended? but, Where is the limit?

A large proportion of the fabrics, and a great number of the applications and newly invented articles have never, until now, been presented to the public. It is to be expected that a portion of the community will consider some of these things simply as novelties, too uncertain to be represented as articles of utility; but it may be remarked, they are not novelties to the author. Many of them have been experimented upon and tested by him for years, in various ways, although it is true the greatest share of them have been but recently perfected. Among the most recently invented fabrics are the fibrous and plated fabrics, the napped, porous, corded, perforated, and indelible fabrics, cord-ware, hollow-ware, and sponge goods, improved air-work, the quilted and ventilated fabrics, and the various hard compounds—caoutchouc enamel, whalebone, buck-horn, and ivory. These, together with the recently perfected and most important applications—ships' sails, globes, carpeting, umbrellas, and life-preserving trunks, and bags, have been withheld for *the purpose of being perfected*, and also to be made public subsequent to the completion of this work.

With regard to the inventions and applications of his own, which are marked with the initials of the inventor, he deems the greater part of them of little importance in comparison with the original discovery, through which, alone, all the subsequent applications and inventions are rendered useful, or in comparison with the fibrous and plated fabrics which he considers exceedingly important in a mechanical point of view, as many of the fabrics, and a great number of the articles which are designed as substitutes for leather articles, could not be made to advantage in any other way, on account of the gum peeling off the cloths and canvas on which it had been spread. It is for this reason that the woven cloths, coated with gum, are not recommended for a greater number of uses. The reason why they are recommended in some cases is, that in the present state of the manufacture, they may be more conveniently made or obtained than the improved fabrics.

Since the properties of the heated or vulcanized gum-elastic and the qualities of the fabrics are becoming better known and appreciated, there is a growing interest in the subject which has drawn the attention of many inventive minds to the application of the substance and the various fabrics, to numerous arts and manufactures, which come within the sphere of their operations. Among the useful inventions made by others are Ship Lights, by Mr. Hidden;* Spring Shoe Clogs and Hydrant Faucets, by Dr. C. Stearns;† and Car Springs, by Mr. F. M. Ray.‡ Many others have since been made. These are alluded to as being among the earliest established manufactures. From the complete success of these various inventions the future success of others may be anticipated.

To enumerate all the articles which it is believed may be advantageously made of this substance, would swell the catalogue itself to a volume. It would include a great proportion of the articles in common use. The writer has selected and described from some of the classes of articles those only which were most prominent. For instance, among the articles or utensils which

* New York.

† New York.

‡ Springfield, Mass.

have heretofore been commonly made of metal, tin, earthen, or pasteboard, almost the whole range of those wares might have been given with equal propriety, at least for specific uses. It is not, however, asserted that these articles, when made of gum-elastic, are to be preferred to the same articles made of other materials, except in particular cases. Neither is it supposed that they will become generally substituted for articles made of glass, earthen, or metal, or lessen the consumption of articles of that kind; but it is maintained, and the articles that are made prove, that for special uses and occasions, they have a peculiar merit.

Notwithstanding the novelty or apparent absurdity of applying gum-elastic to such uses, objections are usually removed when the articles or specimens of them are examined.

Although a large number of articles are classed under the different heads to which they are commonly considered to belong, a great many articles may yet be added to most of these classes, and particularly to the following: House, Ship, and Camp Utensils; Miscellaneous Articles; Toys and Trifles; and Springs. For this reason the chapters are left open.

As a general rule, where few articles of a class are noticed, those are described which were thought most defective in some particulars, as they have heretofore been made of other materials, or of such things as might be most improved by some peculiar property of the new fabric or compound recommended for them.

For instance, ewers are noticed among the chamber ware, because when made of crockery they are so liable to be broken, and to be cracked when water is left to freeze in them. Coal-hods among kitchen ware, because sheet iron hods are noisy, and soon rust out. Dolls, quadrupeds, and birds among toys, because they are so easily made to imitate the different noises natural to each. Others again are noticed for the reason that they can be made more portable of gum-elastic than of other materials. A variety of uses of this substance are perhaps as deserving of notice as those which have been mentioned, and many uses of it will undoubtedly be suggested by different individuals in connection with the different occupations and pro-

sessions in which they are engaged. They, will also unquestionably discover advantages relating to some things which are described, which the writer has omitted to notice. In all cases, however, where he has knowledge of objections to their use, he has not hesitated to point them out.

The impervious articles among wearing apparel, have been particularly noticed for the purpose of pointing out the objections, as well as the valuable properties, of gum-elastic for such uses; while the wearing apparel which is pervious to air, and yet impervious to water, may be much more deserving of notice in many cases: though little will be said in reference to them, until it can be better ascertained how far this double property

of these fabrics can be applied, and made available in the use of caoutchouc. It may, however, be remarked, that the uses, as well as the value of India rubber, will be vastly increased by the introduction of the recently invented fabrics already alluded to, and particularly the wool-napped, plated, and corded fabrics and hard compounds, and also the porous fabrics, as in them the objections which have heretofore been considered insurmountable, viz., confinement of perspiration and the exclusion of air, are overcome.

In attributing to other individuals some of the inventions hereafter described, the writer does not vouch for the facts, but gives them according to the best of his knowledge.

The words caoutchouc, India rubber, and gum-elastic, are used as synonymous throughout the work.

CHAPTER I.

EDUCATIONAL.

Bound paper. Art of book-binding. Book-binding, or covering. Outline maps. Maps. Embossed maps. Illuminated maps. Framed maps. Charts. Globes. Outline globes. Section-globes. Incompressible globes. Blank globes. Embossed globes. Illuminated globes. Self-inflating globes. Black and white-board. Slate and memorandum paper. Slate and pen-wiper. Inkstands. Improved inkstands. Inkstand packing. Artists' India rubber. Pencil-heads. Rules. Portfolios. Desk covering. Map carpets. Pens. Pencils and crayons.

THE importance of the improvements in gum-elastic for educational purposes, have been briefly commented upon in the first volume of this work, and they will also be briefly alluded to in the description of the articles in this chapter. More might be written upon the subject in regard to most of them, and too much could not well be said in commendation of others. Much remains to be done to perfect them, but enough has already been done to prove that the cause of education will hereafter be promoted by the use of many articles made of the vulcanized fabrics. The cheapness of some of the articles, compared with those made of other materials, gives double assurance of the correctness of this view. The expensiveness of globes, which are admitted by all to be by far the best means of imparting and obtaining geographical and astronomical information, has rendered them accessible to few persons, either pupils or teachers. The adaptation and application of gum-elastic to these purposes, will bring within the reach of every pupil in every common school, a perfect globe, at a price within their means; or maps more durable than leather or parchment, at cheaper rates than paper maps are

now made when mounted upon muslin. Some of the articles described in this chapter more properly belong to the department of stationery, and others are only articles of accommodation or convenience for schools; but for the sake of conciseness, and to give a comprehensive view of the whole, they are all treated under the head Educational.

By allusion to two improvements of modern times, one in stationery, the letter envelope; another, the method of teaching with outline maps, the public may better appreciate the value and timely introduction of the two improvements described in this Chapter, caoutchouc bound paper and illustrated outline maps, and map carpets.

The advantages of the method of teaching geography by the use of outline maps was apparent, and the system was partially introduced by the use of paper maps, previous to the application of caoutchouc to this use; but their cumbrous bulk and liability to damage, beside their expensiveness when mounted on muslin, presented an obstacle to the progress of the improvement in this method of teaching geography, so that a suitable material upon which to print these maps, became a desideratum. The timely application of gum-elastic tissue and vellum to this use, meets the necessity of the case.

The binding of paper, as hereafter described, is another improvement, the demand for which is the more imperative, in consequence of the introduction of the letter envelope, which has recently come into general use, and which has become almost indispensable for the comfort and convenience of every one who has any considerable correspondence. This change in the use of paper for letter writing, demands a corresponding change in the method of putting it up for the market; and it is believed that the requisition is met in the article of bound paper.*

* As early in 1836, a medal was awarded to the writer by the Mechanics' Institute of New York, for the application of India rubber to the art of printing. The effort to make the invention practical and useful, has been continued until the present time. The views that were then entertained of the importance of the art may now be appreciated.

BOUND PAPER.

The method of binding paper, which is referred to in the heading of this chapter, is an improvement which combines economy with neatness and convenience. A coat of gum-elastic cement is applied to the edges of the paper on the back of the ream, and over it a sheet of thin gum-elastic vellum for the purpose of a binding. Quire marks are also bound in between the quires or half-quires; these are either bits of tissue paper or a sheet of paper of another color. It is made yet more convenient at a trifling extra expense, when sheets of blotting-paper are bound between the quires. By this method of putting up paper, the separate quires in the reams are always kept in their place; each sheet is kept in its place in the quire until wanted, and every inch of paper left in using parts of sheets, is kept bound until taken out; and while the quire is being used, there is but one half sheet outside or underneath to get soiled. A much more important item in the account of its convenience and utility is, that when a sermon, deed, contract, or other article is written upon the quire, which requires a greater or less number of sheets, the pages may be written consecutively until the deed, or other document, is finished; and when cut from the ream, the document becomes a bound book of the strongest kind, so far as holding the sheets securely is concerned. The delay and inconvenience of stitching or fastening a document with eyelets is not encountered, which, by the common method, has to be done, if at all, at the last moment of executing a document, when it is most inconvenient, and persons are in the greatest haste. The document bound in this way will lie open where it is desired when laid down, and does not give one trouble by its constant shutting; beside, there is a saving of from one to two inches of paper, because it may be written upon quite to the top of the sheet, there being no margin required, as in the case of fastening by stitching or eyelets. The convenience in the use of this paper

may be aptly compared to that of the letter envelope; only the improvement may be said to be as much more important as the consumption of writing paper is greater than that of paper for envelopes.

It is reasonable to suppose that in the first manufacture of cap and letter paper, it was folded chiefly for the following reasons: first, that it might be used in the form of a book when the sheets were stitched together at the back; second, that it might be conveniently retailed by the quire; and, also, in letter writing, that the half sheet written upon might be folded in the other half as a wrapper. The bound paper will be found preferable, in all these particulars, to any before offered to the public. In a brief correspondence, when folded paper is used, there exists the necessity of remitting a half sheet that is not required, or of sending the correspondent a torn half sheet, either of which is objectionable: both these objections are avoided in the use of the bound paper, the sheets being put in the market without folding, of any size required. It is probably not very far from the truth to suppose that as much writing paper is wasted as is necessarily used. The use of a few quires of bound paper will satisfy any person that, in addition to the satisfaction it otherwise gives, a large share of this waste may be avoided.

ART OF BOOK-BINDING.

Some method by which books could be more securely and expeditiously bound, has long been desired, both by publishers and the public. By the use of the vulcanizing process, this object is now attained, and specimens are produced, both with the ordinary bindings, and the vellum and tissue bindings hereafter described, together with the book covers, which it is believed will satisfactorily demonstrate the value of these improvements.

The writer does not pretend that the idea of binding books by means of India rubber originated with himself. It was first

attempted many years ago in England, and it was also attempted in the United States as early as 1836, but it is well known that India rubber, not vulcanized, is too perishable a substance for any such application. The result has been that such attempts, after producing considerable excitement, and raising the expectations of the public, have proved failures. In this instance a very different result is anticipated.

One of the inconveniences attending books bound in the common way, is the difficulty of holding them open so as to be read at the inner margin; and the same remark applies to blank books, with still greater force, in regard to the difficulty of writing up to the back, until the backs are sufficiently broken or worn to admit of it, by which time the leaves are usually so loosened as to fall out. By this new method of binding, this difficulty is completely overcome, so as to admit of the book being opened quite flat and level. The writer believes that it is not saying too much, to affirm that books bound in this way will possess a great advantage over books bound in the usual way, on the score of durability. This improvement is applicable alike to printed and blank books, and although the expense of binding each is less than by the common method of binding with glue and stitches, yet the saving of expense will be greater, and the advantage more apparent in blank books than any others, except it be music books. In addition to the foregoing, an improvement has been made by the writer in the manufacture of covers for expensive books and ledgers from caoutchouc whalebone, with elastic compound for the backs, which it is believed will be found more durable than any heretofore made of other materials.

BOOK-BINDING OR COVERING.

A fabric is made of vulcanized gum-elastic tissue and vellum, for cheap publications, and of gum-elastic corded vellum, of different thicknesses, made in imitation of Russia leather, calf skin, and morocco, for more valuable works. The superiority of

this material as a binding or covering for books, consists in this, that it does not crack or warp, is not injured by worms, water, or oil, is not easily soiled, and is readily cleansed when soiled. Beside, it admits of every style of ornament in the highest perfection.

When finished in the style of the indelible fabrics, described on page , or gilded, it admits of all the elegance of execution, and possesses all the durability, that can be desired in a book cover.

Admitting that these fabrics possess the advantages for book-binding that are claimed for them, another and a great recommendation will be their cheapness and economy; as those which are designed as substitutes for morocco, calf, and Russia leather, may be afforded at nearly the same price as cambrics and paper, and at about the price of the cambrics now used for binding.

OUTLINE MAPS.

These are printed upon the vulcanized India rubber fabrics, both transparent and opaque, and also upon various articles to be used for other purposes besides maps, such as piano-covers, crumb-cloths, and carpets. Arrangements are being made for this manufacture, which may facilitate the method of teaching from outline maps, by printing on this material maps of the world, upon a scale large enough for papering the sides of an ordinary sized room of a school-house, academy, or public lecture-room or dwelling. The same map, when suspended at a suitable distance from the wall, with lights placed behind it, may be used as a transparency for teaching at night. A series of sectional maps, printed on a scale as large as can be conveniently printed upon callenders, after the manner of calico printing, are cemented together and arranged upon rollers, as represented in plate ii., so that they may be passed from one roll to the other. With the map of the world before the pupils or audience, the

geographical position of each state or country may be readily explained, and it is obvious that by the use of such a series of maps as a transparency, together with the map of the world, and the illuminated globe, the study of geography may be taught with a great saving of time and expense, and may also be taught to those whose sight does not admit of close study at night, as well as those who have no leisure hours to devote to study except at night. The perfection of this system, however, will not be attained until skillful artists shall have turned their attention to the subject, for the purpose of illustrating the maps by the best designs, and most truthful representations of the scenery, productions, and costume of the inhabitants of the different countries, and blending these with the geographical outlines.

The panoramic representations, so popular of late, are proof of the interest that may be given to a panorama of the world prepared in this way, for the teaching of geography and astronomy, now too much neglected for the want of such facilities.

When the plates or callenders are once executed, the printing of these maps will be no more expensive than the ordinary printing of calicos, so that sets of these maps will be brought within the reach of any individual or institution, that can afford the expense of atlases or maps of any kind. Outline maps for the use of schools, printed upon this material without illustration, are already offered for sale by the licensees of the inventor; and also crumb-cloths, table-spreads, and piano-covers, with maps printed on them; it having been proved that these impressions, with the coloring, are sufficiently durable for these purposes, not excepting carpeting, which is exposed to hard service.

MAPS.

These are printed upon vulcanized India rubber, vellum, drapery, and tissue; drapery being used for pocket maps, and vellum for those that are mounted. The advantages over paper which are

claimed for maps of this sort, are very many. They possess an intrinsic value for many other purposes besides those of instruction. They may be used with impunity as table or bed spreads, or, in fact, as common crumb-cloths; they may be doubled and folded any number of times, and handled without care; may not only be washed, but also boiled in hot water or soap suds, without injury to the goods or to the printing. They are useful for schools, as they can be brought to the desk of the pupil, instead of his being compelled to climb to use them. In order to demonstrate the utility of the fabrics for this use, the plates of this work are printed on the fabrics, and the maps are executed both in lithograph and copper-plate printing. It is deserving of special notice, that the water-colors, as well as the print of these maps, are indelible.

EMBOSSSED MAPS.

Gum-elastic maps may be so embossed in the manner in which hollow ware is made by engraved moulds, as to show the elevations and depressions of the earth's surface. The article may be made as elegant as the foreign article of this sort, made of pasteboard, and durable as *caoutchouc*. Beside the general geographical correctness and utility of embossed maps, the subject is one of philanthropic interest, concerning the well-being and happiness of the blind.

ILLUMINATED MAPS.

Gum-elastic maps, when made of transparent tissue and illuminated, may be profitably used for instruction at night; and likewise large outline maps for illustration of lectures, &c. For further explanation relating to this class of articles, see transparencies, illuminated globes, &c., page

FRAMED MAPS.

The various kinds of gum-elastic maps may be framed with the same material, and inflated with the self-acting valve tube, as represented in plate , fig. . When gilded or bronzed, these aerial frames resemble very closely the wooden gilded article ; and when collapsed, they occupy very little space. Maps framed in this way may also be used as bathing mats and carpets for children, without injury to the engraving or coloring, while the increased expense of the map on account of the frame is very trifling.

CHARTS.

Are made of vegetable leather, or what might for this use be properly termed gum-elastic parchment. The same general remarks that have been made in regard to maps, will apply to charts. They also possess another superior quality, which is particularly requisite for charts. The dimensions of this parchment do not vary like paper when damped for printing ; in like manner the dimensions of these charts do not vary from change of atmosphere. They may be exposed to wet, and to salt water for any length of time with impunity. The vessel's course can also be marked on them with pencil or ink, and afterwards washed off, if desired.

GLOBES.

The globe has heretofore been so expensive as to be found in schools only of the higher class. No form of map or atlas can

give so correct an idea of the surface of the earth, or of the relative situation of places, as a globe. One of three feet in diameter may be made a complete atlas.

An attempt to make them of gum-elastic was made by the writer soon after the discovery of the acid gas process. Specimens were at that time made of the pure sheet gum, cured by the acid process.

These attempts have been followed up at intervals, until the present time. They have been made of the knit goods, coated florence, and the plated fibrous fabrics. On many accounts, the last-named fabric and sheet gum may in general be best for this use. They are made of various sizes, and when embossed by the method described in the manufacture of hollow-ware, they may be made to supply the present deficiency of globes for the blind.

The utility and importance of these globes to the cause of education must be fully apparent, when it is understood that any child can be furnished with a perfect globe at a price to come within his means. When used, these globes are inflated with air, and when collapsed, may be folded in so small a compass as to be no incumbrance under any circumstances. When the large sizes are filled with hydrogen, they become a highly ornamental and beautiful object.

A convenient method of arranging those that are filled with air for use, may be seen from the plate, fig. 1; suspended from the ceiling, by a cord running to it from the side of the room, fig. 2, or by its axis, like other globes. Another convenient method is to place the inflated globes upon a light hoop stand, or a suspended hoop, figs. 3 and 4.

OUTLINE GLOBES.

After what has been said on the subject of outline maps, comments upon this article are unnecessary, except to say that the same general remarks will apply to globes as to maps.

SECTIONAL GLOBES.

Sectional globes, as represented in the diagrams, Plate , figs. are made from caoutchouc boards or whalebone, which is coated with India rubber tissue or elastic compound. The sections are fitted into the edges of the polar circles or discs, which are formed with grooves to secure them in their several places. When the sections are matched together, before they are fitted to both the polar discs, they are fastened together at the equator by a caoutchouc whalebone hoop, which is slipped into catches upon the sections on the inside, and also by an axis passing through the globe and fastened at the poles. This method of manufacturing globes from gum-elastic is the invention of another.* They may be easily taken apart, and combine the firmness of the ordinary pasteboard or plaster globes with the compactness and portability of the flexible ones which are made of India rubber.

INCOMPRESSIBLE GLOBES.

The only question which has been raised as to the utility of caoutchouc compressible or inflated globes is, whether they can be made firm and exact enough to be mounted for working problems with as much precision as the common plaster globe.

If this be granted, the objection may be removed by making the shells and horizon of caoutchouc whalebone covered with printed India rubber tissue, instead of paper, and the frame of caoutchouc-ivory. Globes made in this manner will be lighter, stronger, and as exact for the working of problems as the plaster globe.

* Charles Goodyear, Jr.

BLANK GLOBES.

This invention was suggested by another.* The article may be made of the gritted fabrics, tissue, or vellum, and its use may be deemed very important for instruction in drawing, as globes may be drawn upon them by the pupil with the pencil and pen, or with the brush and paints, and afterwards either washed off, or fastened on the globe by means of any transparent varnish.

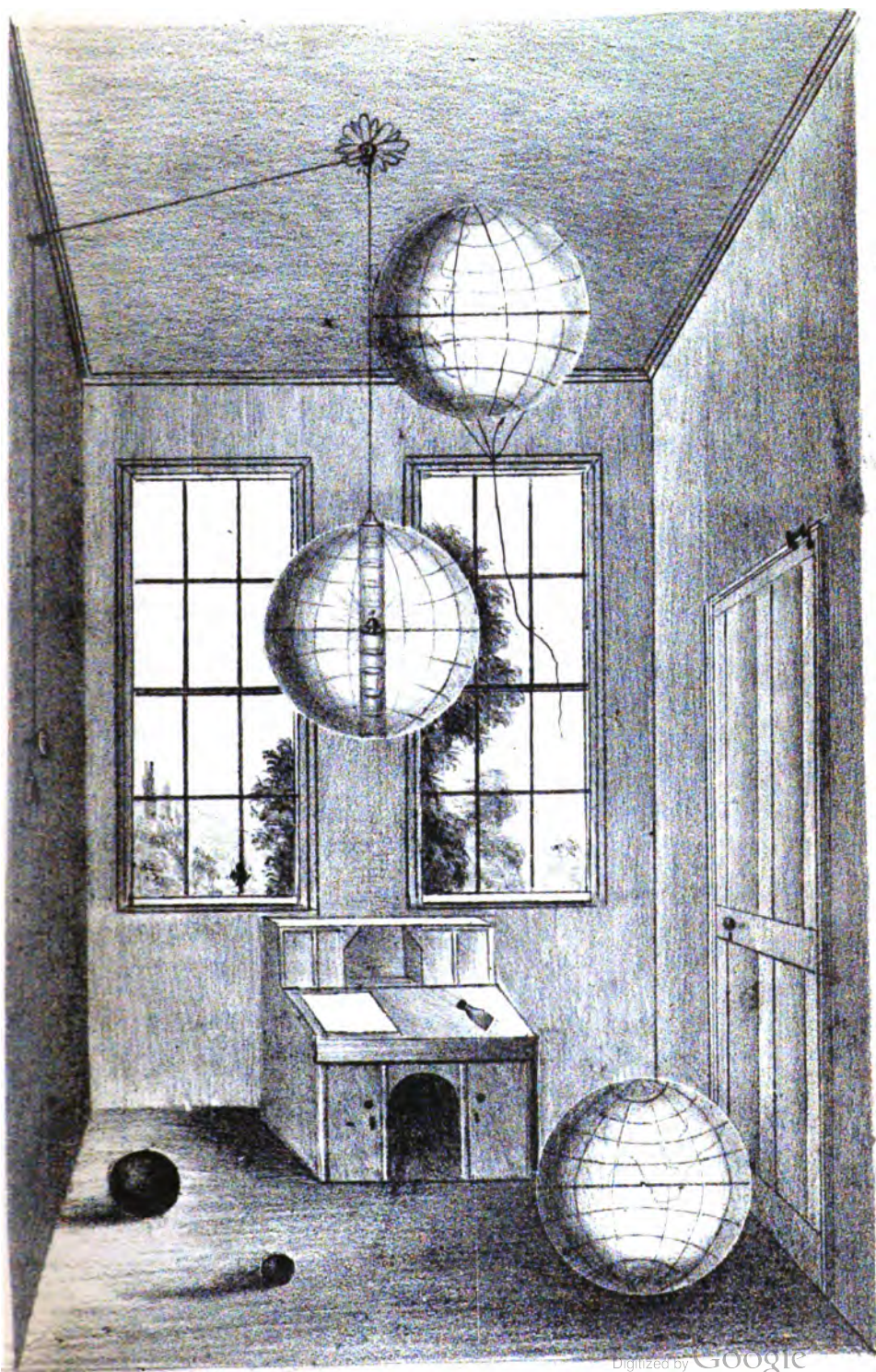
EMBOSSED GLOBES.

These are made of gum-elastic compound, in the same way as hollow ware, and have been before alluded to in the account of that manufacture. These may be said to be much more substantial and durable than wood and plaster, so much so, that they may be used safely as bat and foot balls; and after the first outlay of capital for moulds, &c., the cost of the manufacture will not be greater than for other bat and foot balls, aside from the expense of coloring, which may be done by inking in the moulds in such colors as will stand the heat at the time they are vulcanized.

ILLUMINATED GLOBES.

These are made of gum-elastic tissue and vellum, in the same manner as the globes already described, except that they have a funnel made of the same material, which passes through the globe, and which is cemented to it at each pole; in the middle of the funnel is secured a fixture or cross bar, on which a lamp may be placed. The globe is thereby illuminated and becomes highly ornamental as well as useful for study at night. Although it may be turned round, it cannot be turned over with safety.

* Mr. Henry Bernard, of Hartford, Conn., for many years superintendent of the State schools in Massachusetts and Rhode Island.



SELF-INFLATING GLOBES.

All the different kinds of flexible globes described, may be made self-inflating by suspending them from the top or north pole, when they are hooped on the inside. This is done by a series of hoops, which may be made of wood, metal, or caoutchouc whalebone, according to the size of the globe, and the materials of which they are made, the hoops lessening in circumference from the equator north and south, as they approach the poles, each globe requiring about seven of these hoops; they are covered with tissue, and cemented to the globe on the inside during the process of manufacture. When packed, the hoops fit one within the other, causing the globe to occupy but a very small space. Although they cannot be packed in so small a space as those that are not hooped, they are in other respects much the most convenient; and the whalebone hoops may also be bent or doubled crosswise, and they will again resume their shape, see fig. . These, as well as all the globes before described, may be mounted like other globes by the insertion of an axle, or pivot, in the tubes at the poles, one of which, the self-acting valve tube, is designed for inflating the globe, the other for letting off the air.

BLACK AND WHITEBOARD.

SLATE AND MEMORANDUM PAPER.

Experiments have recently been made with the gritted goods for these purposes, which promise to be successful. A particular account of them will be deferred until more is known of their utility.

SLATE AND PEN-WIPER.

This trifling article is made of gum-elastic sponge, and is very complete for the use for which it is designed.

INKSTANDS.

Among the numerous kinds of inkstands, made from a variety of substances, such as cork, wood, earthenware, china, stone, glass, leather, and the metals, those made of vulcanized gum-elastic may fairly claim particular notice, especially for pocket inkstands. They are durable as metal, extremely light, or (when loaded with metal) as heavy as may be desired, and have one peculiar superiority, that of being soft to the pen, and may have the pen-wiper of gum-elastic sponge attached to, and forming a part of the inkstand.

They can be manufactured of any desirable shape, either of caoutchouc whalebone or ivory, combined with elastic compound and sponge, advantageously.

IMPROVED INKSTAND.

An improved inkstand is made from caoutchouc whalebone, elastic compound, and sponge combined. The ink is raised by compression in different ways. In the one represented in the plate, fig. , the ink is contained in a sack within the inkstand. In that represented by fig. , the sides of the inkstand are formed of elastic compound. In both kinds, turning a screw raises the ink: in fig. , it is done by the follower of the sack; and in fig. , by the top of the inkstand being screwed down.

INKSTAND PACKING.

This is used in a variety of ways, for making inkstands of different kinds tight in the joints. As the public are more or less acquainted with this use of the article, a description of them is considered unnecessary.

ARTISTS' INDIA RUBBER.

It would seem hardly possible to improve upon the properties of the native gum, for erasing pencil marks, all things considered, and yet the vulcanized article has peculiar properties, which are desirable in some cases. It is made of three qualities, the gritted sponge compound, which is very soft and yielding; the gritted magnesia compound, which is very hard, so that it will retain an edge or point, and very nearly answers the purpose of a knife for erasing; and a medium quality which is gritted, and resembles nearest the native gum. All these kinds are sharper, or cut faster than the native gum, but being less adhesive, that which is removed from the paper does not adhere to them, but has to be blown off, on this account they are thus far objectionable.

The durability of these kinds of erasive gum, makes them applicable to the pencil-heads hereafter described, for which the native gum would not answer so well.

PENCIL-HEADS.

These are made of the artist's India rubber before described; they are set into metal sockets, as represented in the plates, figs. 1, 2 and 3, or are formed into rings or heads which are intended to slip over the ends of a wooden pencil or crayon of any description, as represented in figs. 4 and 5. The advantages to be derived from these pencil-heads are these: viz. being attached to the head of the pencil, they are always at hand for instant use, and are convenient either for the pocket or the desk, and though so very small, are so durable as to do the service of pieces of native gum many times larger.

RULES.

Rules of different kinds, both solid and hollow, are made very complete of caoutchouc ivory and whalebone.

PORTFOLIOS.

A superior portfolio is made of caoutchouc board or whalebone combined with gum-elastic vellum instead of morocco. The tablet is sometimes made with an extra thickness of vellum, or a sheet of the gum-elastic sponge fabric overlaying the cover, either of which forms a superior tablet for writing upon.

DESK COVERING.

Gum-elastic felt or vellum is a very cheap and suitable article for the covering of counting-house, portable, and school desks. It is easy to write on a single sheet of paper upon either of these articles.

MAP CARPETS.

Different kinds of map carpets are found useful for the covering of floors, or the aisles of academies. These carpetings are variously described, Chapter , but that which may be particularly recommended for school-houses on account of its cheapness and softness, preventing noise, is the cotton or woolen fibrous article.

PENS.

The application of caoutchouc whalebone to this use was first suggested by another.*

The material has evidently the properties suited to this manufacture ; and from the trial that has been made of these pens, they appear to combine the good qualities both of the steel and quill pen, and on some accounts to be better than either. They are not rusted by the ink like steel, or softened like the quill, and move more smoothly on the paper than either the quill, steel, or gold pen.

PENCILS AND CRAYONS.

The use of vulcanized India rubber for pencils and crayons was first made by another,† by mixing the materials used for them, whether black, red, or white, with the gum. By this invention a great objection to most lead pencils appears to be overcome ; instead of crumbling like the lead, they are somewhat elastic, make a good mark, and may be cut like leather.

* James A. Dorr, Esq., New York.

† Mr. John Rider, New York.

CHAPTER II.

CARPETINGS, TENTS, AND AWNINGS.

*Carpetings. Floor-cloths. Mosaic carpeting. Sponge carpet. Crumb-cloths. Tent carpets.
Tents. Single tents. Tent fly. Awnings. Roofing.*

CARPETINGS.

THE utility and economy of this substance for a variety of carpetings, has been proved beyond a question, and no objection whatever has been found to them, except that which may, in some cases, be made to the odor of the gum.

To numbers who have used them, this has not been found an objection, particularly where the goods have had some months' age before they were put to wear.

The plated and fibrous fabrics are specially recommended for the different kinds of carpeting, because the gum does not peel from them, and likewise because these goods are so inelastic that they do not stretch and become loose, or crack, like the ordinary floor-cloths.

Gum-elastic is particularly adapted to resist that kind of friction to which carpeting is exposed. To illustrate this fact it is only necessary to allude to the durability of the soles of the overshoes, and to the report of some experiments that were made to test the wear of vulcanized gum-elastic, as compared with iron, which are stated, page .

FLOOR CLOTHS.

Are made of the plated or fibrous fabrics, either of cotton or wool, and printed with oil like other floor cloths, or with callenders and in lithography, like other India rubber fabrics.

When printed with oil, the pattern does not wear off so soon as from the common floor cloths, because the ground of the carpet is softer, and when printed in lithography is still more durable, because the ink penetrates the gum. It is also softer to the feet, does not crack under any circumstances, and possesses this very great advantage, that, when the pattern is worn off, the goods are hardly less valuable than when new. They can be re-stamped or re-printed, and may be applied to other purposes, such as tarpaulins, &c. When the gum is applied to one side only of the woolen fibre, the other side being printed, a woolen winter carpet, as well as a gum-elastic summer carpet, is obtained from the same article. The same result is obtained where one side of the goods is napped with flocks.

MOSAIC CARPETING.

This is made like the carpeting already described of the same materials, with this difference ; the pattern is worked in or laid on, the colors being mixed with elastic compound cement, and laid on during the process of manufacture, while the goods are in a soft state, by which means the figure becomes part and parcel of the carpet, and like mosaic, durable as the carpet itself. Marbled and simple patterns are formed in this way by stenciling. More elaborate patterns are formed by printing in colors by lithography ; and when these goods are finished by the method described under the head of Indelible Fabrics, (of which mosaic carpeting is considered one of the most important,) as

beautiful patterns landscapes, &c., can be produced, as can be desired ; and, at the same time, as durable as the fabric itself.

SPONGE CARPET.

This carpeting is made of the same materials, and is printed in the same styles as the two kinds before described. The peculiarity of this article, which forms its chief recommendation, is, that the back of the carpeting is formed of gum-elastic sponge, which renders it soft and elastic, even more so than the softest and most expensive kinds of woollen carpeting.

CRUMB CLOTHS.

These are but a lighter kind of carpet made of the plated or fibrous fabrics, which are made up at the factories into crumb cloths, from eight to twelve feet square, intended for the protection of other carpeting, and commonly, under the table. This article, which has already been introduced to considerable extent, has given entire satisfaction.

TENT CARPETS.

These are made of the same material as the carpeting before described, except that they are of a lighter sort, and so constructed with eyelet holes, that they may be used upon occasion as tents or awnings. When attached to the tent with snaps, as represented in plate , fig. , they render it warm and comfortable, and prevent the rain and snow from driving underneath the tent. It may be considered superfluous to remark upon the adaptation of these fabrics to this use, or to say that whenever

persons are compelled to sleep on the ground, whether in journeying or in encampment, especially when they are thus exposed to wet weather, or upon marshy soil, an article which excludes all dampness must be a great comfort, and a great security to health.

TENTS.

Are made of plated cloths or corded and barred fabrics, and of various patterns, some of which are represented in plate . An objection has formerly been made against India rubber goods for tents, on account of their closeness, excluding the light, and on account of their being black, they were considered hotter in sunshine than canvas. But with the improvement lately made in lighting and ventilating gum-elastic tents, as represented in plate , fig. , together with the fact that they are now made white and have the appearance of canvas, it is suggested that these fabrics will be found to answer this purpose better than the cotton and linen canvas heretofore used for tents. Among the different patterns represented in the plates that may be noticed, are fig. , made of ventilated goods. Fig. , which is pitched with a pole that is jointed, and may be readily taken in parts for transportation. The utility of India rubber tents has thus far been questioned, partly on account of the first cost, and partly on account of the objections stated. By the introduction of the fibrous fabrics, the first objection will be removed, and it is thought that the latter one will be so by the improved varied construction of the articles.

SINGLE TENTS.

Single tents may be best formed of the plated or corded gum-elastic fabrics. They may also be made by pitching the camp blanket, which is sometimes constructed with eyelets, and a fly for this use, as represented in the plate, fig. ; about one-third of the blanket being turned under, so as to form the carpet or bottom of the tent. It is often very desirable to use gum-elastic for sleeping on the ground, but on account of its closeness, in dry and moderate weather, it is unsafe for one to be wrapped in it closely. The use of caoutchouc for the single tent is without objection.

TENT FLY.

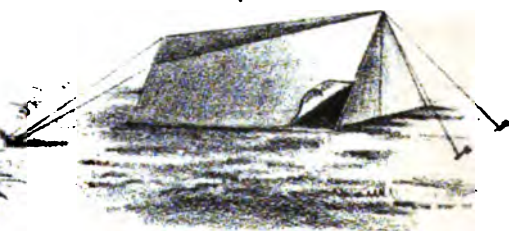
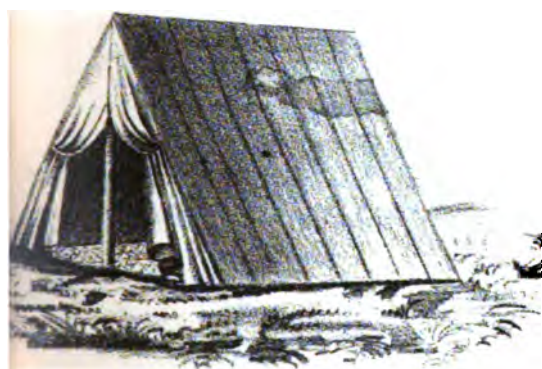
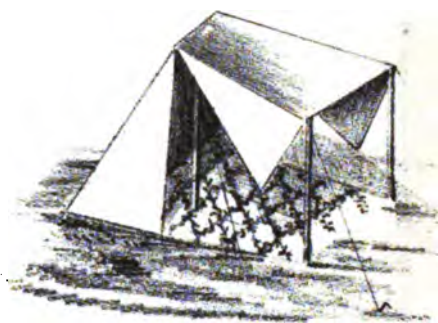
This might be properly termed an awning made with eyelets, which is sometimes used in stormy weather, or hot sunshine, over cloth or canvas tents, in the manner represented in the plate. It may also be used with economy as a chaffing mat, or a tent carpet.

AWNINGS.

Where the first cost of awnings is not a consideration, the cheaper gum-elastic fabrics may be used advantageously, on account of their durability and waterproof quality. Plated linen mosquito netting is most suitable among the different fabrics for this purpose.

ROOFING.

One of the most frequent inquiries of those who speculate upon the uses of India rubber is, Why is it not suitable for roofing. A canvas substantial enough for this purpose, coated by the former method, would have been too expensive. By the present method, however, of plating such canvas with caoutchouc and cotton fibre, a roofing may be made to answer exceedingly well, and not too expensive.



CHAPTER III.

COVERINGS AND SPREADS.

Wall coverings. Table spreads. Piano-forte covers. Box covering. Trunk covering. Umbrella cloths. Bellows coverings. Instrument covers. Mattress covers. Coffee, grain, and fruit covers. Hay rick covers. Storm hat covers. Jar covers. Phial mouth covers. Baggage covers. Desk coverings. Bed spreads. Bed covering and ticking.

GUM-ELASTIC spreads and covers, of various sorts, have heretofore been made of coated cloths, instead of which the fibrous fabrics are recommended for these purposes. The heavier sorts may be nailed or laid upon wood or pasteboard, with paste or glue, and are decidedly more durable than leather of the same thickness for covering trunks, boxes, &c.

WALL COVERINGS.

Gum-elastic tissue, or very thin vellum, is well adapted for the covering of walls. It may be either printed like paper-hangings, or in lithography, or with calenders after the manner of calico printing.

Its most important use is probably the covering of walls, which are exposed to damp. If these fabrics are applied with gum-elastic, or any water-proof cement, they make a desirable covering for walls in cases where paper is useless. When finished after the various styles of printing, coloring, or gilding, they are as elegant as can be desired.

They will not soil easily, and when soiled can be easily

cleansed by washing. Their great durability recommends their use instead of ordinary paper-hangings, although their first cost is more than the cheaper kinds of paper.

TABLE SPREADS.

Are made of napped and plated fabrics. These goods are proved to be particularly adapted to this use, and are found to be most effectual in preserving furniture from dust, and the effects of the atmosphere. Various kinds of ornamenting are made use of for this purpose, so that the article may be as highly ornamented as can be desired, either by printing, painting, gilding, or bronzing.

PIANO-FORTE COVERS.

Like the table spreads already described, are made of napped and plated fabrics. Their great superiority consists in their preserving the tone of the instrument, by protecting it from the changes of the atmosphere, and the polish by keeping it secure from dust. Previous to the discovery of the vulcanizing process, common India rubber cloths were, for the above reasons, uniformly used for this purpose, by one of the most celebrated piano-forte makers in the United States, to protect the instruments in the warehouse previous to sale. The same remarks apply to these covers that have been made of table spreads and indelible goods, in regard to finish and ornamenting.

BOX COVERING.

Bandboxes, and a great variety of pasteboard and light wooden boxes, may be covered with vellum or tissue to great advantage; tissue being used for the lighter, and vellum for heavier kinds. The goods may be applied to the wood or pasteboard either with paste or glue, in the same way that leather and paper-hangings are applied. That travelers in the present age should rest satisfied with the slight service rendered by paper boxes, can only be accounted for by their cheapness. Although their first cost is but little, they are in the end expensive on account of the very short time they last, oftentimes when exposed to wet, not answering for a single journey. By covering paper boxes with vellum, and staying them in the manner described, page , specimens of these have been found to do service for years, like trunks.

TRUNK COVERING.

Vellum is suitable and cheap for the covering of trunks, and vegetable leather as a substitute for animal leather for the heavier and more expensive kinds of trunks. The goods may also be used as a substitute for canvas, and made up with the needle for outer coverings, or chaffing mats, for boxes and trunks, where it is desirable to protect them from wet.

UMBRELLA CLOTHS.

Gum-elastic tissue, corded tissue, and plated muslins, are best suited for umbrella coverings. The lightest description of plated cotton musquito net is very suitable for this purpose. All these fabrics may be made up with the needle, but are most completely made up at the factories, as described under the head of Umbrellas, Chapter

BELLAWS COVERINGS.

Among the many uses of these fabrics, there are probably none to which they are more perfectly adapted than for the covering of bellows. The fact of this important use of the fabrics having been hitherto so little noticed, can only be accounted for by its being lost sight of in the multitude of other applications of the fabrics. Gum-elastic vellum is most suitable for small hand and accordion bellows; plated canvas and vegetable leather for smiths' and organ bellows. With these fabrics there is no loss of power, as is the case with animal leather, by the escape of air through the pores. They are not scorched or ignited from sparks like leather, and they are not injured by water. They are, for these purposes, undoubtedly more durable and cheaper than leather.

INSTRUMENT COVERS.

Instruments of various kinds are advantageously covered with the fabrics. Musical instruments are well protected by them

from the changes of the atmosphere, and dust, and it is asserted by the most celebrated instrument makers, that the tone of instruments is preserved by the use of these covers. They are manufactured in the shape of bags or cases, quite air-tight, or otherwise, to fit the various instruments for which they are intended.

MATTRESS COVERS.

These are made of impervious plated fabrics, and are intended expressly for camp or ships' use, for the protection of beds and mattresses. The mouth of the cover may be tied tight enough to exclude water when immersed in it. A number of mattresses protected by these covers, when thrown into, and secured to a boat ever so leaky, will make it a complete life-boat, much safer to rely upon than if the same mattresses were filled with air. The same covers will, upon occasion, serve as ships' letter-bags, or for the preservation of property, and when filled with light articles will answer the same purpose as above specified as floats or life-preservers.

COFFEE, GRAIN AND FRUIT COVERS.

These are made of plated caoutchouc fabrics, of a conical form, at the factories, and are well suited for the protection of coffee, grain, or fruits, but more particularly coffee, when gathered and left for a time in the fields. See plate , fig. .

HAY RICK COVERS.

These are made at the factories, of the same material, in the same way as coffee covers, already described. For such a use,

the first cost of a sufficient number of these to protect the hay of a whole field is an objection, but when it is considered that the same set may be used by a neighborhood, and when the length of time they will last is taken into consideration, they will be found to be economical.

STORM HAT COVERS.

These are made of tissue or corded tissue, either at the factories or with the needle. They are designed as a substitute for the oiled silk covers, being not only better, but much cheaper than the oil silk. They are sometimes made with a cape of tissue, see plate , fig. . This article, when made with the cape, like the storm cap or cape, will be found very useful and exceedingly comfortable to the wearer in stormy weather.

JAR COVERS.

The tops of these are made of caoutchouc whalebone or board, covered with tissue or vellum, united with a rim of gum-elastic compound, see plate , fig. . They will be found to answer a good purpose for housekeepers for securing pickle, preserve, and other jars, and for making them perfectly tight, which it is often exceedingly difficult to do, either by common corks or by tying.

PHIAL MOUTH COVERS.

Gum-elastic drapery and tissue may often be used with advantage by druggists and others, for securing the mouths of bottles, jars, and phials, instead of skins and parchment, that are often used.



BAGGAGE COVERS.

Baggage covers are manufactured of plated, corded, and barred caoutchouc fabrics. These fabrics are lighter, stronger, and much more suitable for this purpose, than the India rubber coated cloths that have been heretofore applied to this use. It may be said that this is emphatically one of the proper and unobjectionable uses of gum-elastic fabrics.

DESK COVERING.

See Chapter I.,—Educational.

BED SPREADS.

Plated cloth and vellum are both found useful for this purpose. They are made from a yard to a yard and a half square, and are commonly cut from the fabrics that are sold at the shops, for the protection of feather beds and mattresses in cases of sickness, and in the nursery. When spread upon the bed and under the clothing, their use is without objection. This article is not designed as an outer covering or spread, and should not be used for that purpose, except when persons are exposed to storms or extreme cold.

BED COVERING AND TICKING.

The *porous*, fibrous, and plated fabrics will be found suitable on ship-board and elsewhere, for the above uses, on account of their cleanliness and durability.

CHAPTER IV.

HOUSE, SHIP, AND CAMP WARE AND UTENSILS.

Clothes brushes. Portable brushes. Scrubs. Hand scrubs. Covered bottles and phials. Covered demijohns. Wash-boards. Sieves. Screens. Tunnels. Bellows. Ice-water tanks. Wood carriers. Muff bags. Muff boxes. Door mats. Table mats. Coffee-pot and urn strainers. Pans and dishes. Tea and coffee sets. Improved preserve jars. Flower-pots and vases. Flower sacks. Ewer and wash bowls. Pitchers and tumblers. Water buckets. Portable water buckets. Fire buckets. Portable fire buckets. Wash tubs. Portable wash tubs. Baskets. Portable baskets. Dish baskets. Market and fish baskets. Coal hods. Table cutlery. Pocket cutlery. Furniture. Improved brushes. Elastic brushes. Paste bag.

THESE articles are made of the different fabrics and wares ; when required, they are stayed in various ways with iron or wood, in order to render them more or less portable, or give them a greater or less degree of stiffness. It may be stated in respect to a great variety, if not all articles of this kind which are not to be brought in contact with fire, that in many cases they possess peculiar advantages over either earthen, wood, or metal, especially for ships' and camp use ; and, although for some time to come their first cost must be greater than that of wood or earthen, yet, when properly made, they will be found, in consequence of their durability, in comparison with other things, *not to be expensive*. Descriptions and drawings of only a few of these articles are here given. The recent introduction of sponge and the hard compounds among the fabrics, bids fair to extend this chapter almost indefinitely, if there is ever an attempt to enumerate all the articles of this kind that may be made of them to advantage.

CLOTHES BRUSHES.

These are constructed of elastic sponge, of various forms and patterns, either fastened upon a wooden or caoutchouc ivory

handle, or so shaped and otherwise stiffened as to need no handle. They do not remove dust from some cloths so well as bristle brushes, but in every respect they may be said to answer the general purposes of a brush far better than bristles; and they are decidedly more effective than any other brush for cleaning silk and cotton velvets, also silks and crapes. If any persons are disposed to question the utility of these brushes, let them consider the peculiar property of gum-elastic, and its usefulness in cleaning paper, and they will not doubt that it may also be adapted to the purposes here specified.

PORTABLE BRUSHES.

These are also made of coarsely embossed elastic compound, or vellum, or gum-elastic sponge, so constructed as to be inflated with the self-acting valve tube like other air-work, as represented in plate xiii., fig. 1. The same properties attach to them as to the brushes before described, with one other advantage, they can be packed in a very small compass when collapsed.

SCRUBS.

Scrubs are made of caoutchouc sponge or packing fastened upon blocks of different kinds, with or without handles, according to the use for which they are designed. They are fast getting into favor for scouring vessel's decks, and for the scrubbing of floors. They are incomparably more durable and economical than bristles. A nautical term, that of squeal-gee, is also applied to this article with a handle. See plate xvi., fig. 1.

HAND SCRUBS.

These are made of a heavy sheet of gum-elastic sponge, fastened upon a board, to be used for the purpose of scouring floors. For this purpose they are more effectual than brushes made of bristles; and on account of their durability, are in the end, much cheaper. See plate xiii., fig. 2.

COVERED BOTTLES AND PHIALS.

These are first covered with gum-elastic vellum, and afterwards with caoutchouc whalebone. They are subsequently vulcanized in moulds. Coverings of this sort serve to keep the bottles or phials from breaking, and they possess one great advantage over those heretofore covered with willow, straw, and splints, that when the bottles are broken, the contents will be safe; such covered bottles being in fact two bottles, one internal of glass, and one external of gum-elastic.

For persons travelling, for ship's use, and for sportsmen, their superiority cannot fail to be appreciated. Small bottles and phials are most neatly made by being first covered, and then heated in moulds like hollow ware, by which method greater uniformity, and more perfect execution can be attained in the workmanship.

COVERED DEMIJOHNS.

These are covered in the same way as phials and bottles, except that a heavy description of gum-elastic vellum cord is used for covering them, and the glass is protected by a heavier coating of vellum; or, for many purposes glass need not be used, but the demijohns may be made like sportsmen's bottles, or

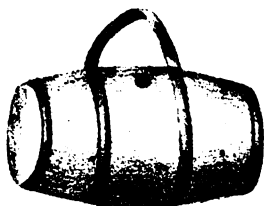
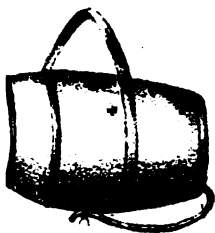
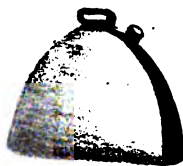
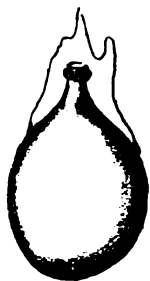
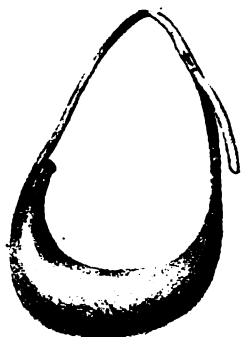
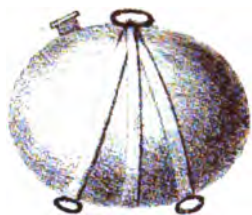
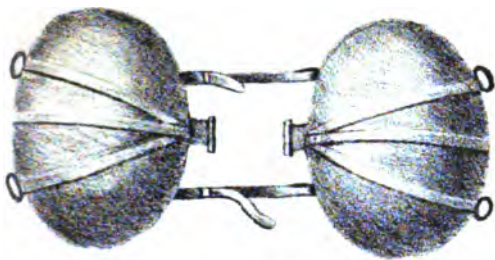
flasks of caoutchouc whalebone, and stiffened with hoops and bands of wood or iron. Demijohns of this sort may be highly recommended for containing acids, which soon destroy willow coverings; and also for wines and liquors, which improve by being kept from the light. One important consideration in the use of these demijohns is, that there is no danger of the loss of the contents, even if the glass breaks, or of other goods being damaged from the spilling of acids, which often happens from the breaking of demijohns. See plate , fig. .

WASH-BOARDS.

These boards are made with a covering of elastic sponge, moulded in the common form of wash-boards. Few specimens of the articles have yet been made, but from the trial that has been made of them they may be expected to give satisfaction, although the first cost may prove a hindrance to their general use. The elastic sponge will probably also be found useful in its application, among the numerous varieties of washing machines that are now made wholly of wood.

SIEVES.

The hoops of this article may be manufactured of caoutchouc board, whalebone or other suitable materials. For the sieve or strainer, perforated elastic compound or whalebone is used. How far this article will be adopted for common use, remains to be seen; but the inventor is of opinion, that in certain cases, they will be found highly useful for straining or cleansing articles or chemicals that corrode, and destroy haircloth or wire sieve. .



SCREENS.

These are made of perforated caoutchouc drapery, or whalebone, which may, in many cases, be substituted in safes, windows, and cupboards for metal gauzes, on account of its cheapness, and not being liable to corrode.

TUNNELS.

Are made of cord ware, hollow ware, elastic compound, or caoutchouc whalebone. They are designed for druggists' use, as a substitute for glass or wedgewood. For common use, they possess the superiority over tin of not being liable to be damaged, or to corrosion. When made of cord ware, hollow ware, or elastic compound, they have another advantage, that of being portable. See plate xiii., fig. 3.

BELLWS.

Wooden bellows are covered with the vulcanized fabrics, as proposed under the head of bellows' covering. An improved kind of smith and other bellows is made by covering a hoop of iron or wood, as represented in plate xiii., fig. 4, and afterwards cementing the covering to the hoop. This kind is made up only at the factories, while the gum is in a soft state. Beside the advantages which have been claimed for these fabrics, under the head of Bellows Covering, this article avoids entirely the great objection of leakage, about the parts where leather is commonly nailed to the wood, of which almost every person must have knowledge who has had much occasion to use bellows.

ICE-WATER TANKS.

This article is made of vegetable leather, and is constructed with two apartments, one for ice, the other for water, with a faucet attached, as represented in plate , fig. . It answers the purpose of keeping water cool a great length of time, when ice is put into the separate apartment, and equally as well with bad as with good ice.

WOOD CARRIERS.

Though an article of limited demand, may be advantageously made of vegetable leather or plated canvas, instead of harness leather, which has heretofore been used for this purpose. See plate xiii., fig. 5.

MUFF BAGS.

These are made of plated or *corded vellum*, with a mouth of light fabric, of gum-elastic vellum or tissue, that may be tied quite tight. They are a cheap and valuable article for the protection of furs and woolen goods from moths. If the articles are well shaken and beaten before they are packed, for the purpose of removing the eggs of the moth, the goods kept in these bags will be safe from the ravages of this destructive insect.

MUFF BOXES.

These are made of pasteboard, covered with gum-elastic tissue or vellum. The lids are made so as to be air-tight, when shut, in the same manner as bandboxes, see plate , fig. . Furs that are well beaten and shaken before they are packed, will not be molested by moths if kept in these boxes.

DOOR MATS.

These are made of covered cordage or elastic sponge, of the same pattern as the common rope-mats, or otherwise. The superiority claimed for this article, consists in its softness and durability, and the ease with which it may be cleansed, simply by rinsing it in water ; besides, they are not liable to decay, or to get damaged, by being left outside the door, exposed to the weather. See plate xiii., fig. 6.

TABLE MATS.

These are made of gum-elastic wicker work, or heavy vellum, or caoutchouc whalebone, all of which fabrics are well adapted for the article. The fabrics may be elegantly ornamented after the manner of indelible goods, as well as in various other styles. They are in no way affected by the heat of dishes, and are recommended on account of their great durability and cleanliness.

COFFEE-POT AND URN STRAINERS.

These are made of perforated caoutchouc ivory. It is supposed that this fabric will prove superior to tin or metal for this and other like purposes, because it will not rust like tin, nor corrode like metal.

PANS AND DISHES.

Some kinds, at least, of pans and dishes may be made with advantage from gum-elastic, both from the elastic fabrics and from caoutchouc enamel, which are superior for some uses to such articles made of other materials. This was proved at an early day by the use of the article in the factories in the course of the inventor's experiments. They were made from curiosity, or from the want of them for immediate use. The lapse of time, however, proved that they remained whole while successive sets of tin and crockery were either rusted out or broken. This circumstance first suggested the idea of making them for the market.

TEA AND COFFEE SETS.

These sets are manufactured to be used in the field, the camp or kitchen, and on shipboard. In many cases, there will be economy in their use; though to recommend them generally instead of crockery, would be absurd.

IMPROVED PRESERVE JARS.

Different methods have been suggested in this work for corking and covering preserve, pickle, and other jars; another method, invented by a crockery merchant of New York, although somewhat more expensive, may be considered an improvement deserving particular notice. The covers of earthen or china jars, (the jars being suitably constructed for this purpose,) are, by a screw and bar, or cross-piece, pressed down upon a shoulder or rest in the jar, which is made quite airtight by means of a ring or packing of gum-elastic between the lid and shoulder of the jar. See plate , fig. .

FLOWER-POTS AND VASES.

Perforated caoutchouc whalebone or board, although expensive in comparison with crockery or wood, is a suitable material for flower-pots, on account of the free transmission of air and moisture through it. Caoutchouc ivory, not perforated, may be applied to flower-vases without the same objection of expensiveness, for the reason that it may be made so ornamental as to be substituted for china, and because they are not liable to be broken like china, while they are equally water-proof.

FLOWER-SACKS.

This is a convenient and useful little article for the florist, or others who wish to transport or carry flowers with moisture, or roots with earth. They are made by machinery from gum-elastic fabrics, after the method described, Vol. I., page , and with such rapidity and cheapness that they may be afforded at the reasonable rate which is required for a purpose like this.

EWERS AND WASH-BOWLS.

The liability of these articles to be broken, when made of earthen, particularly where they are used on board ship, in hotels, and in all situations where water may be left to freeze in the ewers, renders the application of gum-elastic to their manufacture very desirable; they may be made either of caoutchouc whalebone or ivory.

PITCHERS AND TUMBLERS.

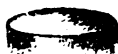
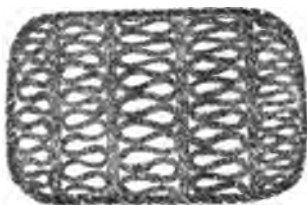
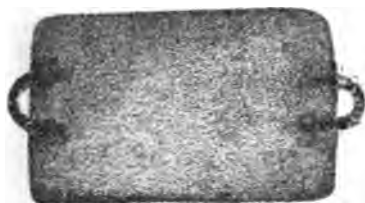
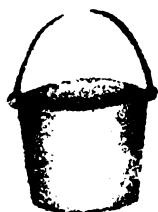
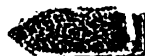
Sportsmen's cups of different kinds, and portable or flexible pitchers of gum-elastic compound, have been described elsewhere in this work, but the articles here referred to, which it is supposed may be found useful, are made of caoutchouc whalebone. They are not liable to be broken, and there does not appear to be any particular objection in their use.

WATER-BUCKETS.

Are manufactured of caoutchouc whalebone or board, with a hoop of wood or iron around the top covered with the same material. These buckets are not only useful in many cases for vessels, for the camp, and the garden, but also for the kitchen.

PORTABLE WATER-BUCKETS

Are made of gum-elastic felt or vegetable leather, stayed around the top with a covered hoop of wood or iron, in the same way



as the buckets before described. The fabrics are made of that degree of flexibility that the bucket may be compressed into a small space for transportation, and yet so firm and elastic that it will resume its shape when unpacked. For this, among other reasons, it is a useful bucket, particularly for coachmen and wagoners. See plate , fig. .

FIRE-BUCKETS.

Caoutchouc whalebone and leather are suitable materials for fire-buckets, from which they have been made, to considerable extent, in the United States.

In the early stage of the manufacture, coated canvas was used for water and fire buckets, which did not give satisfaction on account of the gum peeling from the canvas, but since the above articles have been substituted for the canvas, a good article has been obtained. See plate , fig. .

PORTABLE FIRE-BUCKETS.

It is oftentimes necessary, and especially on board of vessels, to carry a number of water or fire-buckets, to which there is a great objection on account of the space which they occupy. A kind of bucket which it is proposed to manufacture of caoutchouc leather, is represented in plate , fig. . The shape of this article appears to be objectionable, as it does not open so as to be round like other buckets, but it is supposed that the advantage arising from the compactness of stowing them, may more than counterbalance the objections to their shape. When in use they are kept open by a brace at the top. See plate , figs. .

WASH-TUBS.

These are manufactured of caoutchouc whalebone or board, and stayed with wood or iron hoops and splints, covered with gum-elastic materials. They may be recommended for lightness and durability, for ship and camp use, if not for the kitchen. See plate , fig. .

PORTABLE WASH-TUBS.

Portable wash-tubs are manufactured of caoutchouc plated and corded fabrics. They may be attached to a wooden frame or horse, as represented by the child's bath-tub, plate , fig. or they may be arranged by movable supports, as represented by the bath-tub, plate , fig. .

BASKETS.

Field and other baskets may be manufactured of wicker-work. Although more expensive, they are more durable than splints or willow. Fancy and fruit baskets are also made of caoutchouc, without objection on the score of expense, in comparison with many other kinds that are less durable.

PORTABLE BASKETS.

Baskets of different sorts are so constructed of gum-elastic wicker-work, as to have that degree of pliability that they may be compressed in a very small space, and afterwards resume their shape with stiffness sufficient to be used for all ordinary purposes.

DISH-BASKETS.

Baskets of any kind, such as are used in public houses or on board steamboats, when lined with gum-elastic vellum, instead of zinc or tin, will be found lighter to carry, occasioning less noise, and less risk to the dishes placed in them, than when lined with metal.

MARKET AND FISH-BASKETS.

These baskets, which have usually been made of willow or splints, may be advantageously made of caoutchouc whalebone and vegetable leather, and are very valuable on account of their durability, water-proof quality, and cleanliness, for purposes of this sort, for the reason that they may be used for marketing, and afterwards cleansed, so as to be used for liquids, or other substances, such as flour, meal, &c., if desired.

COAL-HODS.

Coal-hods are manufactured from caoutchouc whalebone board or vegetable leather; they are stayed and rendered firm by hoops and braces of wood or iron.

The improvement which may fairly be claimed for this article is, that it will not rust like sheet iron, that it is cheaper than copper or brass, and is not noisy to use like either of these.

TABLE CUTLERY.

One of the most important applications of caoutchouc ivory is that of handles for table cutlery. When put on in a soft state,

before they are vulcanized, they adhere so firmly that they will not come off, and it is impossible to get them off without great violence ; neither are they in any way injured by lying in boiling water any length of time ; are equally beautiful as buffalo-horn or ivory, and may be ornamented and inlaid in a variety of ways.

POCKET CUTLERY.

A very important improvement is made by the use of caoutchouc ivory for the scales or covering of the handles of pocket cutlery, as well as the handles of many other instruments.

The ivory scales are joined to the handles without rivets, when the ivory is in a soft state, before being vulcanized. This method is more particularly described in the inventor's specification of the patent for this improvement.

FURNITURE.

Different kinds of furniture may be covered with veneers of caoutchouc enamel rolled out into thin sheets before it is vulcanized. The cost of these veneers, in comparison with fine wood of different kinds, is much less, and they are unquestionably superior on the score of hardness and durability, from not being liable to warp and crack.

IMPROVED BRUSHES.

Several kinds of brushes, and particularly clothes, hair, and tooth brushes, are made advantageously of gum-elastic ivory and whalebone, in the following manner. The block or part in which the bristles are inserted may be made of wood or of gum-elastic whalebone. In this case, the holes in which the bristles are inserted are made with pins by one impression or stamping in the plastic material. The part in which the bristles are inserted is afterwards glued or fastened by screws into the handle of India rubber ivory, which is made with a rim around the edge to receive it. See plate , fig.

ELASTIC BRUSHES.

These brushes, which are of curious construction, are formed of octagonal or round tubes of elastic compound, set endwise upon a handle of caoutchouc ivory. These tubes are cemented together at the sides, and when cemented upon the handle, the brush has the appearance of a honey-comb on the face. They are better than the sponge brush, described in the beginning of the chapter, for removing dust from garments, but not so good for removing grease spots, &c. See plate , fig.

PASTE BAG.

The inconvenience of keeping flour paste for any length of time in such a state that it will not soon dry up, is experienced by many. This difficulty may be avoided by the use of a bag made of India rubber fabrics, as represented plate , fig. That represented by fig. , made in the shape of a plain bottle, fig. , is constructed like self-inflating air-work. In both of them the tubular stopper is used. This bag will be found both economical and convenient.

CHAPTER V.

MECHANICAL.

Machine belting. Well ropes. Deckel straps. Elevators. Cane elevators. Printing tympana. Printers' rolls. Compressing apparatus. Preserving apparatus. Improved portable preserving apparatus. Steelyards and scales. Bakers' belting. Printing aprons. Match dies. Windmill sails. Thimbles. Sail-makers' thimbles. Stereotype plates. Stereotype moulds. Tool handles.

THE appliance of the fabrics, and particularly of the elastic compound, to machinery, and also its uses in facilitating in various ways the manipulation of different departments of numerous manufactures, continue to increase; descriptions of such of them as are ascertained to be certainly useful, are given in this chapter.

MACHINE BELTING.

This was one of the first manufactures of India rubber in the United States. It was manufactured to a considerable extent by the Roxbury Company, as early as 1836. The gum being used upon the inside only, as a cement for holding the different layers of canvas together. It was found to answer tolerably, so that the manufacture of it was continued during the existence of the Roxbury Company. Upon the application of vulcanized gum-elastic to the same use in 1843, the right for that branch was disposed of by the writer to Henry Edwards, Esq., of Boston, who, in 1845, purchased also of him the celebrated Roxbury machinery, and employed it in the manufacture of machine belting. In the manufacture of this article, the gum is used for

cementing several layers of strong canvas together, according to the size of the belt. The gum is also applied upon the outside of the belt. The article is becoming so generally known and extensively used, that to speak of its qualities is unnecessary, except to say that in addition to its general usefulness, it may be considered an indispensable article where belting has to be run under water.

WELL ROPES.

Ropes, or India rubber covered cordage, or straps of narrow machine belting, are advantageously used for wells, on account of their water-proof qualities.

DECKEL STRAP.

The deckel strap is a belt of vulcanized gum-elastic, about one inch in thickness, and one inch and one-fourth in width, and from ten to twenty feet in length. This article is used as a part of the fondernier machine for the manufacture of paper, and prevents the pulp from escaping in the revolution of the machine. This is one of those peculiar applications, in which both the elastic and water-proof qualities of this substance are desirable, and in which no other substance answers so good a purpose, as it is run constantly in water.

ELEVATORS.

These are made of caoutchouc fabrics, the belt of the elevator being made in the same way as machine belting. The buckets may be made of tin, and attached in the same way as has com-

monly been done with leather elevators, or they may be made of caoutchouc whalebone, and cemented on in the process of manufacture. They are used in flour mills for elevating flour and grain, or other articles, from vessels to store-houses, see plate , fig. . The cheapness of this article, as well as its durability, recommends it to the notice of millers in particular.

CANE ELEVATORS.

It has been suggested by a gentleman formerly engaged in the manufacture of sugar in Louisiana, that broad India rubber belts, with carriers attached, would be made very superior to the elevators now in use for elevating cane to the grinding mills, when they are placed in the upper story of the building.

PRINTING TYMPANS.

During the whole course of the writer's experiments, frequent inquiries have been made of him by different printers and publishers, at different times, whether India rubber fabrics might not be successfully applied for printing tympan. Various experiments were made at an early day, both with the common and the vulcanized coated cloths. These experiments failed. Recently a trial has been made of the fibrous cotton fabric, or vegetable leather, which appears to be completely successful; and which, if so, is an acquisition to the art of printing.

PRINTER'S ROLLS.

As of printing tympan, so of printer's inking rolls, it is a desideratum with the trade to find some substitute for the common roll, made of molasses and glue. Experiments were made with the native gum, and also with vulcanized elastic compound, both of which failed from being too unyielding. Some experiments are now being made with gum-elastic sponge, which it is confidently expected will prove successful.

COMPRESSING APPARATUS.

This is the invention of another, for the purpose of salting meats. It consists of two copper or iron cylinders, one inserted within the other, and connected by a belt of gum-elastic, as represented by the diagram , plate .

The machine is designed for salting meats instantaneously, or at least in a very few minutes. It has been tried experimentally, and found to answer most completely. The same principle may also be applied to tanning hides, and to other purposes equally well. It is a fact not generally known, that in some climates where cattle are most numerous, as in some parts both of North and South America, the beef cannot be salted at all. Should these machines be found to answer the purpose of salting in these countries, as they do here, it is an exceedingly important improvement, both as relates to those countries and the world at large. Some individuals of enterprise in New York, are, at this time, giving their attention to this subject. Should this application prove successful, a more minute account of the apparatus, and the benefits resulting from its use, will be given.

PRESERVING APPARATUS.

The invention of another, here described, is an apparatus for preserving fruits, vegetables, and other perishable articles from decay, by which they may be transmitted from one country to another. It consists of a box or barrel of any shape desired, with a loose or movable lid; the vessel may be ever so rough or unfinished, but must be strong to prevent collapsing. It is covered with a case of gum-elastic leather in two parts, and a band or belt of gum-elastic compound is drawn over the opening or seam, between the two parts of the covering. When this article with its contents are packed, the air is pumped out, and the tube being stopped, the article becomes air-tight. This apparatus has been tried experimentally for shipments to the West Indies, and found to answer.

The preserving of articles by hermetical sealing has, for many years, been practised to some extent, with tin cases, but the expense of preserving fruits, &c., by this method, would be too great for transportation. It may be expected that by some such method as here proposed, the fruits of different climes may be transmitted from one part of the globe to the other, including such as, from their perishable nature, could not otherwise be kept long enough for this purpose. See plate , fig.

IMPROVED PORTABLE PRESERVING APPARATUS.

The principal, if not the only objection which appears to exist to the invention before described, is the difficulty attending the re-shipment of packages. This has, however, led to an improvement upon this invention, which removes this objection.

When this apparatus is made for transporting articles that are not liable to be injured by pressure, the gum-elastic case is simply a bag of caoutchouc fabrics, in two halves, the edges of which are made of an elastic fabric. These bags are drawn over and secured upon an iron or other metal band, as represented, plate , fig. .

When fruit or other articles which are liable to injury by pressure, are to be preserved, and shipped or transported, these bags are distended by a jointed metal or wooden frame, as represented, plate , fig. . By this arrangement there is no loss of packages, as in the case of preserving articles in tin boxes. In all cases the air is exhausted from these bags and receivers with the force-pump, through a hose which is attached for this purpose. The frame packed with the bags occupies little space.

STEELYARDS AND SCALES.

The application of vulcanized gum-elastic to steelyards and scales, particularly hay scales, is the invention of another. The manufacture has not been established, but from the well-known properties of this substance, there is little reason to doubt that there will be economy and advantage derived from this application to large scales.

BAKERS' BELTING.

At a very early period, and soon after the discovery of the vulcanizing process, gum-elastic was successfully applied to the

manufacture of belts, upon which the dough is cut by the machines which are used for the manufacture of biscuits and crackers. See plate , fig. .

This was invented by another, and tried with the native gum, previous to the discovery of the vulcanizing process.

PRINTING APRONS.

This is an endless belt or apron, made of gum-elastic felt or vegetable leather; they are used in printing calicos and other stuffs, instead of the woolen felt blankets, which have formerly been used, and are objectionable on account of their expensiveness and want of durability. It is obvious that the properties and texture of this fabric are such as to remedy this defect, in this extensive department of industry.

MATCH DIES.

Gum-elastic compound has been found exceedingly useful for match dies, instead of lead and copper, for striking up impressions in paper, sheet metal, and other materials.

WINDMILL SAILS.

The advantages that may be derived from the use of India rubber fabrics instead of common canvas for windmill sails, are very obvious. They are made from plated canvas and the corded fibrous fabrics.

THIMBLES.

Thimbles may be made either of perforated caoutchouc whalebone or ivory, with metal ends. It is supposed, that for cheap thimbles, these substances will be less objectionable than brass or iron.

SAIL-MAKERS' THIMBLES.

The hand pieces of these thimbles are made of perforated vegetable leather, into which the thimble irons are set before the thimbles are vulcanized.

STEREOTYPE PLATES.

At the suggestion of another, the writer has made these plates from vulcanized caoutchouc whalebone and ivory, and also from the elastic compound, both of which materials it is confidently expected will be found useful in this art.

The practical advantages which are to result from this invention for printing books are yet to be determined; but in other branches of this art, there is no question as to its importance, as in the case of block and cylinder printing for paper-hangings, having the advantage of cheapness, and not being liable to warp or split. The plates may be wound upon drums or cylinders for cylinder printing, without difficulty.

STEREOTYPE MOULDS.

Stereotype moulds, made from the hard compounds of caoutchouc ivory and whalebone, and vulcanized, are unquestionably an improvement which will afford new facilities for moulding other materials, and for multiplying works of art, especially where they are reproduced in caoutchouc compounds. Notwithstanding their first cost is something more than that of plaster moulds or casts, there is great economy and advantage in their use, because, instead of being lost, like plaster, with every impression, they may be used, like metal, an indefinite number of times.

In the state in which the caoutchouc material is used for making the moulds, it is so soft and plastic, that perfect copies may be immediately taken from the finest work of art, in any material, whether metal, plaster, wood, leather, cloth, or paper.

TOOL HANDLES.

It is well known that much perplexity and annoyance are experienced in the use of very many kinds of tools and instruments, from the handles coming loose from them. This evil may be remedied, particularly in all small tools and instruments, by the use of caoutchouc ivory and whalebone for the handles. These handles, when in a soft state, are put on the rough shanks of the instruments, and are vulcanized on them so firmly that they will bear a hard blow of the hammer without injury and without becoming loose.

CHAPTER VI.

PACKING, SHEATHING, AND CAULKING.

Sheathing. Caulking. Engine packing. Box packing. Door packing. Window packing.

THE reader will notice that the statements relating to the articles described in this chapter are mostly qualified, except that of engine packing, which has proved quite successful, and the tests in the use of it being so much more severe than upon other articles described in this chapter; the writer feels warranted in assuming something in anticipation as relates to them, notwithstanding they have not yet been sufficiently tested in a practical way. When that shall be, it is believed that the advantages will be found to exceed, rather than fall short of what is here presumed upon.

SHEATHING.

It has at different periods been suggested to the writer, that India rubber fabrics would be useful for sheathing, instead of copper sheaths. The writer's knowledge of the subject, does not enable him to judge in the case. It appears certain that the stayed elastic compound, made as spring hinges are, might be nailed over the seams of the timbers of vessels, so as to stop leakage, oftentimes when they are started; and it is highly probable that the caoutchouc board and whalebone recently invented will answer for sheathing, even if the other fabrics do not.

CAULKING.

This is among the uses that have been suggested for the vulcanized fibrous fabrics. The properties of the substance would seem exactly to adapt it to such a use, but whether it will answer, or if it should answer, whether it will not be too expensive, remains to be proved.

ENGINE PACKING.

This article is made of gum-elastic felt, and is manufactured extensively.

Engine packing of heated or vulcanized gum-elastic felt, is now becoming so well known, and so generally introduced, both in the United States and England, that to treat of its utility would be superfluous.

BOX PACKING.

Dry goods or other boxes for the transportation of merchandise, may be packed and rendered tight by a cord of gum-elastic sponge, drawn into the edges of the article to be made tight, as specified of water-proof boxes and trunks, page , and of improved sash, page .

DOOR PACKING.

The impossibility of making doors and windows at all times quite air and water tight, arises from the swelling and shrinking of the wood, by the alternate changes of the atmosphere, and attempts to make them quite tight often causes a worse difficulty, that of preventing their opening and shutting. It is believed that the plan here proposed will completely overcome these obstacles, as relates to doors. Doors may be made one-half to three-quarters of an inch smaller than the door casing, and a round cord of gum-elastic sponge being inserted in a groove in the door casing, and also in the edge of the door; the two cords together projecting somewhat more than the space between the door and the casing, will make the door tight, and allow it to open and shut, notwithstanding the variations of the weather.

WINDOW PACKING.

Window frames may be packed by grooving the frame, and fitting into the groove a cord of gum-elastic sponge. If fitted into the bottom of the sash also, this arrangement will not only make windows tight, and keep out driving storms, but also guard persons against injury by the falling of windows. For further explanation of this use of gum-elastic for this purpose, see Improved Window Fixtures, Chapter .

CHAPTER VII.

VALVES AND STOPS.

Self-acting valve tube. Pump valves. Chain pump valves. Faucet stops. Engine and bellows valves. Bag clasp. Bag vice stop. Bag slide fastening. Corks. Phial and bottle corks. Expansive cork. Soda fount corks. Jar corks. Demijohn corks. Inflating corks. Improved screw stopper. Improved valve stopper.

THE unalterable properties of heated or vulcanized gum-elastic, as relates to heat and cold, and the numerous grades of texture and solidity of the substances, between that of the softest sponge and the hard vulcanized compound, would seem to render it certain that some of them are admirably adapted for such articles, and in particular those that are used under water, or in liquids.

The first use the writer ever made of gum-elastic, was of the common article, for an improvement in faucets, in 1832. At that time the goods did not answer the purpose. It remained for a professional gentleman* to make a completely successful application of vulcanized gum-elastic to this use.

Some of the articles under this head have been fully tested, and found to be useful ; others are under experiment, or being tested, with every prospect of success.

* Doct. Charles Stearn, Springfield, Mass.

SELF-ACTING VALVE TUBE.*

Although this may appear to be a very trivial article, it is very important to the perfection of air-work, and globes in particular. The impracticability of joining gum-elastic to metal, so that it will be secure, is well known, and by the use of metal tubes great injury has been done to the credit of this kind of work, the articles having generally leaked where they are connected with the tubes. This defect is completely obviated in the gum-elastic tubes, inasmuch as they become part and parcel of the air-work to which it is united. The head or part of the tube that projects from the life-preserver, cushion, or other article to which it is attached, is made of caoutchouc whalebone. The lip valve, or end of the tube that is inserted within the article, is made of gum-elastic compound or drapery, or other light gum-elastic material. This lip becomes tight by the internal atmospheric pressure, and when the article is inflated, the greater the pressure the tighter it becomes.

The weight, as well as the expense of the metal tubes, is another objection to their use for all small articles, and particularly for such as globes, fancy, parlor, and bat balls.

In the use of the gum-elastic tube, it becomes necessary to open the valve by means of some instrument; it may be done with a pin, broom splint, or tooth pick, but the most convenient article for this purpose is a small light tube of vulcanized gum-elastic compound, or stiffened paper, which may be looped to the article in the manner represented in the plate , fig. . The writer has adopted another method in some cases, which is more expeditious for letting the air escape, by inserting another tube without any valve on the opposite side of the ball, with a gum-elastic cork attached for stopping.

* The idea of a tube of this sort was first suggested to the writer in 1838 by Mr. E. M. Chaffee, but was only made practicable by the use of the improved fabrics.

PUMP VALVES.

The water-proof quality of the caoutchouc compounds and sponge renders them suitable materials for the above purpose. An application has been made of a valve similar to the self-acting valve-tube before described, and patented by another.* This valve is intended for ships' pumps, and is said not to be liable to be choked, like other valves. It is made of gum-elastic compound, see plate , fig. .

CHAIN PUMP VALVES.

A very simple and useful chain pump, represented by fig. , plate , is being extensively introduced in the United States. It is suggested by the writer, that gum-elastic sponge stops upon covered cordage, would be far cheaper and better for this purpose than the iron chain, and iron valves or stops that are now used.

FAUCET STOPS.

There are numerous ways of applying the caoutchouc fabrics for the improvement of faucets. Among these inventions may be noticed the one first made,† represented by fig. , plate . In this the stop of elastic compound is ingeniously applied in the form of a cone. Another,‡ as represented by fig. , where the fluid passes through an elastic hose, and is stopped either by a

* Dr. E. Pratt, New York.

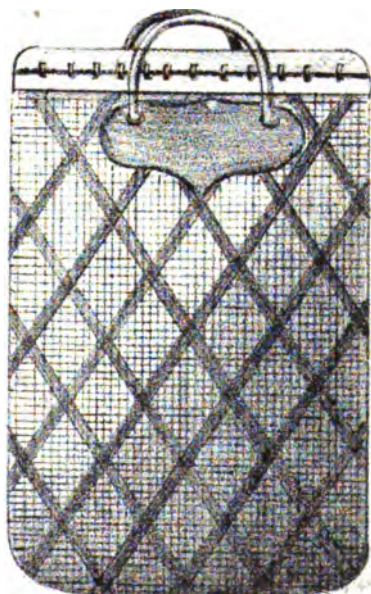
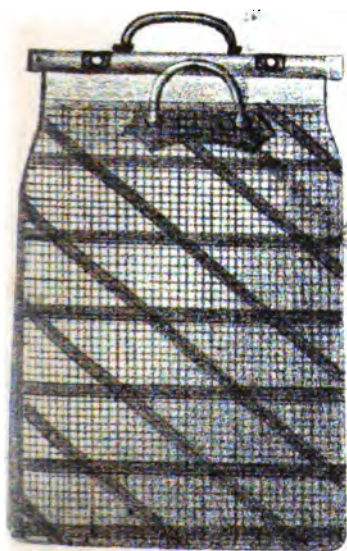
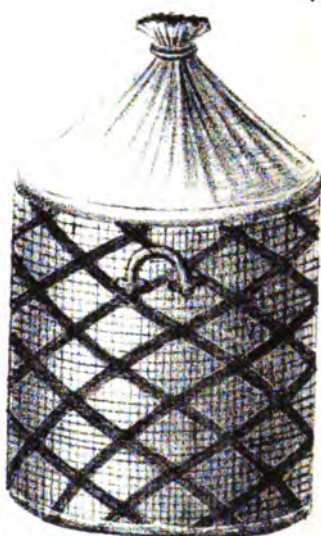
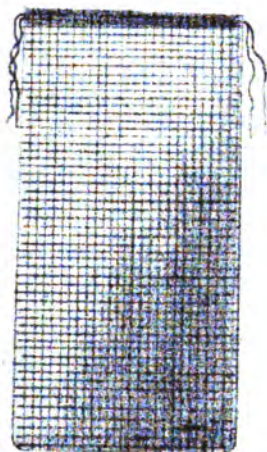
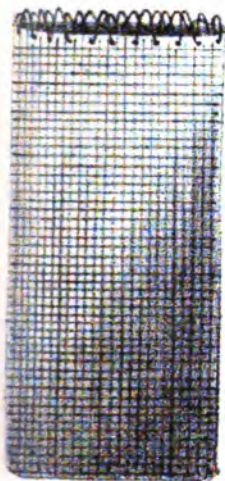
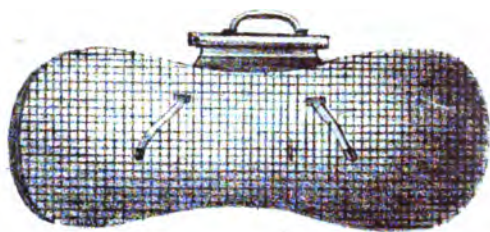
† Invented by Dr. Charles Stearns, Springfield, Mass.

‡ Invented by

screw or spring lever. Another tap and faucet of the common pattern, fig. , instead of being made of wood, is made of caoutchouc whalebone, the tap being packed with elastic compound.

ENGINE AND BELLOWS VALVES.

Several of the fabrics are, on account of their air-tight and pliable properties, suitable materials for the valves of steam and other engines, and also for the valves of house, organ, and smith's bellows.



BAG CLASP.

This article, as represented by fig. , plate , is made either of *malleable* or wrought iron, in the form of bag clasps heretofore in common use. They are plated with caoutchouc whalebone, with a cushion of elastic compound or sponge fabric on the inside. When shut, the jaws are compressed and secured by hinge catches, which, in connection with the cushion, causes the bag to be quite water- and air-tight.

BAG VISE STOP.

This stop is made of two straight pieces of wrought or malleable iron mouldings, fluted or grooved in a dove-tailed fashion, so as to hold the cushions of gum-elastic sponge with which they are fitted. They are cemented to the bag in such a way as to allow it to open freely, as represented in the plate , fig. . When shut, the jaws are fastened by hinge catches, in the same manner as the clasp above described, which also renders the bag completely water and air-tight.

BAG SLIDE FASTENING.

This slide or fastening for bags is a caoutchouc whalebone tube, made in the form of a tube, with a slit on one side running the length of the tube, as represented plate , fig. . It is slipped endwise over the mouth of the bag, which is made with a cord or projection upon each side of the mouth of the

* The idea of this kind of stop was first suggested by Mr. Nathaniel Hayward.

bag, so as to prevent the slide from coming off, and it is locked on by a padlock at the end.

This stop does not make the bag so completely water and air proof as the two kinds of stops before described, but it is more cheaply manufactured, and renders bags sufficiently tight to answer as life-preservers, when filled with apparel, and it is exceedingly convenient to slip off and on in use.

CORKS.*

As there is something in the manufacture or use of the different sorts peculiar to each, they are separately described as follows :

PHIAL AND BOTTLE CORKS.

The cheaper kinds of these are made plain like common corks. Like other gum-elastic corks, they are made of sponge in moulds, like hollow-ware. They are sometimes made with a rim, as in the plate , fig. , to prevent the cork being driven into the bottle. A somewhat more expensive, but more complete article, is made with a metal eye, and also with a metal plate and eye, as represented in the diagram, fig. 2 and 3. They may not only be drawn by the eye, with a fork or nail, but may be safely connected with the phial or bottle by a gum-elastic cord looped to the eye at one end, and the phial or bottle at the other, see plate , fig. . When it is considered that one of these corks will ordinarily last much longer than the vessel

* The English house of McIntosh & Co. were the first to manufacture India rubber corks, which were made by them of rope or felt, covered with native gum-elastic, as early as the year . These have been used to considerable extent, but they have been found defective for general purposes, from the defects of the native gum.

to which they are attached, corks of this kind may be considered cheap and economical, although their first cost is more than other corks ; and certainly so if they preserve the contents of the bottle in cases where they would otherwise be lost by the use of defective corks. In a cheap bottle, these corks may be said to answer all the purposes of an expensive bottle and ground stopper.

The query is here proposed, whether it is more economical in the corking even of cheap liquids, beer, soda, cider, &c., to use in the course of a season one hundred cheap corks for one bottle, or one good cork attached to the bottle one hundred times.

The deterioration of liquors and other articles from defective corks, is a thing of constant occurrence, in particular after the cork has been once drawn by a cork-screw. It is confidently expected that gum-elastic will prove an effective remedy for this evil.

EXPANSIVE CORK.

This cork is made of gum-elastic compound, with a screw of metal or caoutchouc whalebone passing through it. Turning the screw compresses and enlarges the cork, and makes it fast ; reversing the screw allows it to be drawn : see plate , fig . This cork is the invention of another.

SODA FOUNT CORKS.

These are made in general like phial corks before described, with the exception of a hole passing them, for the purpose of allowing them to be screwed to the fountain fixtures.

They are found to answer the purpose for which they are intended completely, and their extra cost is of little account, considering their durability and convenience.

JAR CORKS.

The foregoing description may be applied also, in general, to jar corks, except that it may be found economical to manufacture them, and also some of the larger kinds of those already described, by filling the interior of the cork with light wood, refuse cork wood, or other light substances.

Common jar corks being so much larger, are usually more defective, and for them there is the more need of improvement in the article.

DEMIJOHN CORKS.

It has been the practice of manufacturers of acid to use clay stoppers for demijohns of acid, which answer a tolerable purpose until the clay is once loosened, after which the druggist and the consumer have no safe and convenient method of corking up the acid, except by resorting to expensive bottles with ground stoppers. It may be expected that these corks will remedy this deficiency.

INFLATING CORK.

This is a cork made with one of the self-acting valve tubes connected with it, so that the gum-elastic bottles and tanks may be inflated without difficulty, and used as life-preservers; and also that liquids may be drank or drawn from them without taking out the cork or bung. This is done by means of a pipe of vulcanized gum-elastic, or any other suitable material, which may be looped to the cork or bung. It has been found somewhat diffi-

cult to handle flexible gum-elastic bottles or tanks, when the corks or stoppers were out, without spilling the liquids. The design of these corks is to obviate this objection, and also to make them answer as life-preservers for fishermen, sportsmen, and sailors. See plate , fig. .

IMPROVED SCREW STOPPER.

The objections to the use of metal screw stoppers for bottles are chiefly their expensiveness, the difficulty of making them tight, and the danger of losing them. It is proposed to obviate these difficulties in the article here described, made of caoutchouc whalebone, as follows: A swivel, with a ring attached to it, is inserted in the top of the cap of the stopper, by which the cap may be attached to the bottle, or the strap of the bottle.

A washer, of gum-elastic packing, is inserted inside in the top of the cap, which serves to stop the bottle perfectly tight, and, therefore, prevents any escape of the contents of the bottle, either through the screw or through the opening made by the swivel. When attached to India rubber bottles, or to glass bottles covered with India rubber, the female screw of the stopper is cemented into, and forms a part of, the bottle. See plate , fig. .

IMPROVED VALVE STOPPER.

This is the invention of another.* It is formed of two caoutchouc tubes, one within the other; the outer tube is composed of caoutchouc whalebone, the inner tube or hose of elastic compound, which is attached to the outer tube at the bottom only; the ring of the hose being firm at the top serves as a stop. When the flexible tube is straight with the inflexible one, the stopper is free for the escape of air or liquids; but when the flexible tube is twisted, their escape is prevented by the tube being closed, and it is kept so by being held in its place by the ring at the end of the tube. See plate , fig. .

* Nelson Goodyear, brother of the writer.

CHAPTER VIII.

SPRINGS.

Car springs. Carriage and coach springs. Buffers. Cart and truck springs. Wagon seat and rail chair springs. Whale springs. Door springs. Improved door springs. Lock springs. Gun lock springs. Stirrup springs. Umbrella springs. Elastic bands. Elastic ties. Improved hose ties. Girth springs. Hinge springs, or spring hinges. Elastic tape. Glove springs. Shoe springs. Improved shoe springs. Vest springs. Corset and stay springs. Truss and belt springs. Hat and cap springs.

A GREAT variety of springs are made from gum-elastic, many of which it is difficult to make from steel, or any other substance; and if made, it might be impossible to apply them to some purposes to which the gum-elastic spring is applied without difficulty.

Applications of this material for springs are constantly increasing, but the public are so well acquainted with the elastic property of India rubber, that only a brief notice need be given of those springs that are most extensively used.

CAR SPRINGS.

Car springs, consisting of alternate discs of India rubber and metal, like those represented in plate xvii., fig. 1, are the invention of another individual* who many years ago made experiments with the native gum for this purpose, which were unsuccessful. The successful manufacture of car springs of heated or vulcanized gum-elastic, was commenced in America by Mr. Ray soon after that time, and the extent to which it has

* Mr. Fowler M. Ray, New York.

been carried in so short a period is remarkable. As near as can be ascertained, there has been an average of one thousand pounds of gum per day manufactured into this kind of car springs, during the year 1849.

A subsequent improvement has been made in car springs by Mr. Ray, by making the spring of one block of gum, and hooping it with iron rings, instead of using alternate discs of India rubber and metal.

These springs act by the elasticity of the gum by compression. It is applied in the manner represented in plate xvii., fig. 2. To speak of the importance of an article so generally used upon railroads, is needless.

A diagram is given, fig. 3, of a car spring, which, it is thought, may be an improvement in the construction of car springs, on account of the greater lateral motion obtained by it.* Several kinds of air springs have also been invented by different individuals, made of vulcanized gum-elastic, one of which is represented by figs. 4 and 5, plate xvii.;† another, which is represented by figs. 6 and 7.‡

CARRIAGE AND COACH SPRINGS.

There is more difficulty in applying this substance to coaches and carriages for common roads, so as to preserve a good appearance of the vehicle, on account of the lateral motion that is necessary to be had, than there is in applying it to cars. They have been applied very successfully, so as to ease off the strain from elliptic springs, which may be made light and weak for the purpose, when arranged in the manner represented in the diagram, plate xvii., fig. 8.

* Invented by Mr. E. M. Chaffee, of New Haven.

† Invented by Mr. John Lewis, of New Haven.

‡ Invented by Mr. of New Haven.

BUFFERS.

These are blocks or springs of gum-elastic, placed between and in front of the cars, (instead of underneath them,) to prevent their jarring by concussion. They are an English invention, and not so generally introduced in America as the car springs, see plate xvii., fig. 9.

CART AND TRUCK SPRINGS.

These are made in the same manner as the car springs described, and are placed underneath various kinds of carts and trucks to be used on common roads. They are placed underneath the body and over the axle of the cart or truck, much in the same way as they are underneath cars. See plate , fig.

WAGON SEAT AND RAIL CHAIR SPRINGS.

These are blocks of gum-elastic sponge, which are placed under the feet of the chairs of railway cars, wagon seats, and the seats of other vehicles. In this manner the seats of all vehicles without springs, may be rendered easy and comfortable, at a very trifling expense.

WHALE SPRINGS.

These are made of elastic cordage, and of one or more gum-elastic ropes, of any size required, with a shackle attached at each end, by which they are to be connected with the cable. The use of the spring is to ease off the strain upon the cable, by which the whale is secured from breaking loose from the ship in

rough weather, while taking the blubber on board the vessel. This invention was suggested by an experienced whaleman; and, although as yet untried, it is more than probable that it is an important use of elastic cordage. See plate , fig. .

DOOR SPRINGS.

Door springs are made of knit goods or elastic compound, in the form of an endless belt, about twelve inches in length, one inch in breadth, and one-eighth of an inch in thickness. They are attached to the door on either side, with the different fastenings, as represented in plate ii., by fig. 5, for the inside, and fig. 6, for the outside of the door.

The elastic ties or letter bands, are sometimes used in the same way for cupboard, bookcase, and other doors. The stayed compound, described on page , made for this purpose, may be used with still greater economy when nailed to gates, or on the doors of out-houses. They answer an excellent purpose at a small expense when properly made.

IMPROVED DOOR SPRING.

Instead of the endless belt above described, a spring may be made cheaper and more durable, of a single strip of gum, about one-fourth of an inch thick, and from one to two inches in width, stayed at each end with a small hose, in the manner described on page . They are attached to the door by inserting the fixtures through the hose, see plate , fig. .

LOCK SPRINGS.

Elastic compound lock springs are the invention of another,* the patentee for the application of vulcanized gum-elastic to car

* Mr. F. M. Ray.

springs. Specimens of door locks have been made by him, as represented in plate xvi., fig. . The springs are simply small blocks of gum-elastic compound, which act by the elasticity of the gum by compression against the bolt of the lock or latch. It is believed that lock springs of this kind will be preferable to steel, on the score of economy and durability, not being liable to rust or to get out of repair.

GUN LOCK SPRINGS.

The use of vulcanized gum-elastic compound for gun lock springs was also the suggestion of another,* and there is good reason to suppose that it will be found useful for that purpose, as it is for car and other springs.

STIRRUP SPRINGS.

This article is manufactured by inserting a piece of the stayed compound fabric into the stirrup leather, near the stirrup. The spring should be of the same width as the stirrup leather, one-quarter of an inch in thickness, and from one to two inches in length to suit the customer.

The stirrup leather may be either of animal or vegetable leather.

The horseman will find this an improvement tending to his comfort. See plate , fig. .

* Mr. John Gresson, Jr., New York.

UMBRELLA SPRINGS.

This is one of the uses to which braided cord of native gum, had been applied for some years in Europe, previous to the manufacture of vulcanized gum-elastic in America. It is a convenient and useful article, like the glove spring, whether made of the native gum or vulcanized gum-elastic.

ELASTIC BANDS.

These bands are either endless belts, or rings of elastic compound. They are used for various purposes, for files of papers, for covering with ribbons for ladies' elastics, and for elastic garters without covering, for securing small packages, and also the covers upon small boxes, and for memorandum and pocket-book fastenings.

In many other cases, for the temporary binding and tying of articles, they are found very convenient. See plate , figs.

ELASTIC TIES.

These bands or ties are manufactured from sheets of gum-elastic drapery or compound, which is first made into tubing of a suitable size, and then cut up into rings, or endless ties, by machinery. They are found very useful and convenient for druggists and tradesmen, for tying up small packages of every description. When receptacles are kept by house and shopkeepers for the preservation of these ties, they will not be found very expensive, taking into account the saving of time in tying and untying. Besides, the price will become reduced, by improvements and facilities in the manufacture, as well as by a larger demand. The

writer is of opinion that when better known these ties will be considered an indispensable convenience for house and shop-keepers, even if they are not quite so cheap as common pack-thread. These remarks are not applicable to their use for heavy packages, as they would not only be too expensive, but too elastic for such a purpose.

IMPROVED HOSE TIES.

When the tubing of which the ties, above described, are manufactured, is made with a stay of cloth about half an inch wide, running its whole length; if, instead of being cut up by the machinery into fine thread, it is cut into rings or bands from one-fourth to three-fourths of an inch in width, elastics and endless springs will thereby be formed with stays, by which stays they may be stitched on to pocket-books, or buttoned or stitched on to hose, or any other article, from which, when attached, the ties need not be removed, except to wash the articles. See plate , fig. .

GIRTH SPRINGS.

These are made of perforated stayed compound, of different widths, to be inserted in girths, surcingles, &c. for the purpose of giving them elasticity. See plate , fig. .

HINGE SPRINGS, OR SPRING HINGES,

Are made of elastic stayed compound. Their use, and the method of their application, may be understood by reference to the description of air and water-proof trunks and boxes, described, Chapter , page .

ELASTIC TAPE.

This is cut from sheets of elastic compound, from one-quarter to one-half of an inch in width. Among other uses for it, is that of tying ladies' hair without danger of cutting it, for which purpose it is much valued by those who have used it.

GLOVE SPRINGS.

See Appendages of Wearing Apparel, Chapter XVIII.

SHOE SPRINGS.

See Appendages of Wearing Apparel, Chapter XVIII.

IMPROVED SHOE SPRINGS.

See Appendages of Wearing Apparel, Chapter XVIII.

VEST SPRINGS.

See Appendages of Wearing Apparel, Chapter XVIII.

CORSET AND STAY SPRINGS.

See Appendages of Wearing Apparel, Chapter XVIII.

TRUSS AND BELT SPRINGS.

See Appendages of Wearing Apparel, Chapter XVIII.

HAT AND CAP SPRINGS.

See Appendages of Wearing Apparel, Chapter XVIII.

CHAPTER IX.

HYDRAULIC.

Engine hose. Hydraulic presses. Force pumps. Water wheels. Suction hose. Improved spiral hose. Connecting hose. Hydrant hose. Faucets. Reservoirs. Filters.

SOME articles which come under this head were made, to a limited extent, at an early day. Hose of some kinds was found useful made of native gum. Hydrostatic beds were also made by spreading India rubber cloths over boxes of water, bottles were also among the first articles manufactured to considerable extent by the Roxbury Company.

ENGINE HOSE.

This is an article which has been made, to some extent, of coated canvas, but which has yet been found to answer but indifferently, chiefly on account of the gum peeling from the cloth. It is expected that gum-elastic felt, and the fibrous fabrics, will be found to remove the objections that now exist. Engine suction hose, which is made upon wire wound spirally, can unquestionably be made to advantage of these fabrics.

HYDRAULIC PRESSES.

Gum-elastic compound felt and vegetable leather, are now being successfully applied for hydraulic rams, presses, &c., as a substitute for animal leather. Those who are acquainted with the properties of these fabrics, will not require for them any recommendation for such uses.

FORCE PUMPS.

The plan of this article, answering to the diagram in plate , fig. , to be made of caoutchouc, was given by another.* This pump has not yet been applied to use, but it is obvious that the great objection which exists in all mechanism, and particularly in pumps, that of friction, is, in this case, almost entirely removed, and in other respects it would appear that this fabric must answer a good purpose for force pumps.

WATER-WHEELS.

These are made on the same plan as elevators before described. They have not yet been practically applied to use, but *certain* inferences may be drawn with regard to their utility, from what is known from the use of the iron chain wheel, which is operated on the same principle; they may be built at so great a reduction of cost, in comparison with other wheels, that the invention appears to the writer to be an important one, especially when it is considered that the size of all other wheels is limited, and that these may be built of any height, to that of a hundred feet or more; consequently, a large power might be

* Mr. Edwin M. Chaffee, Roxbury, Mass.

obtained from a small rivulet, and, in situations and places where it would be extremely difficult, if not impossible, to build wooden water wheels.

SUCTION HOSE.

Hose for different purposes, is made by covering wire wound spirally with gum-elastic. By this method of manufacturing hose, an article is obtained which is flexible to be coiled, and is not liable to collapse. On that account, this is a description of hose which answers in some cases where metal and leather hose will not.

IMPROVED SPIRAL HOSE.

Specimens of hose have recently been made of hemp cord, covered with vellum and wound spirally, which recommends itself on account of superior strength. It is lined inside with canvas to prevent its tearing longitudinally, and is not liable to be cut, and when damaged may be mended by riveting, like leather hose.

CONNECTING HOSE.

This is made of sheets of gum-elastic compound, and has been found exceedingly useful for joints, in connecting various sorts of tubes of other materials, used for chemical and other apparatus.

HYDRANT HOSE.

Hydrant hose is made either of *gum-elastic felt*, coated canvas, or *vegetable leather*, and is already becoming extensively used in the United States. The substance being so admirably adapted to this use, it was at first manufactured more extensively than other articles, and from being improperly made of coated cloths, the credit of the article was impaired by the gum peeling from the cloth; but recently the article is highly approved.

FAUCETS.

Faucet valves and stops have been described in Chapter VII., besides which faucets of various kinds, and especially taps and faucets which have heretofore been made of wood, may now be made wholly of vulcanized gum-elastic materials.

RESERVOIRS.

Cisterns and tanks may, for many purposes, with economy be lined with gum-elastic, but the reservoir or tank here alluded to, is made of gum-elastic fabrics, so manufactured that it will be elastic, and not burst when water freezes in it. These tanks, or sacks, are designed to be placed under the roof in the attics of dwelling-houses, with hose connecting with the water spout, and

other hose extending downward to the different apartments of the building. The convenience of this arrangement for the supply of rain-water in the rooms, and also for extinguishing fire, must be apparent. See plate , fig. .

FILTERS.

Perforated caoutchouc ivory and whalebone are suitable materials for the strainers of filters, or the filters may be made wholly of these materials instead of metal. Fig. , plate , represent a filter of this kind attached to a flexible water reservoir of gum-elastic.

CHAPTER X.

MILITARY.

Musket covers. Wagon floats. Ambulanche. Powder bags. Provision bags. Pistol holsters. Port-fire cases. Cannon covers. Sword sheaths. Cartridge boxes. Camp blankets. Cannon sponge covers. Sword and pistol covers. Military belts. Canteens. Water tanks. Military caps. Blasting cartridges. Budge barrels. Tents and tent carpets. Bandages. Military stocks. Haversacks. Knapsacks. Miners' knapsacks. Gun and pistol stocks. Air pontoons and pontoon boats. Air pontoons. Pontoon air boats. Air balsaor. Air pontoon rafts.

In the early stages of this manufacture, and during the Mexican war, an assortment of articles were made for the government of the United States. They were made to order in great haste, before the best gum-elastic fabrics for such purposes were invented, and they were manufactured chiefly from the coated cloths, which were not found to answer the purposes of leather, as the fibrous fabrics *have done* since that time. It is not surprising, therefore, that mistakes should have been made in the first attempts to introduce some articles for the use of the army and navy. Nor is it surprising that some articles that are now known to be useful, should then have been imperfectly manufactured, and consequently have failed at that time to answer the expectations which were formed of them. Many of the articles were highly approved by the troops and officers in the service; among which may be noticed camp blankets, tent carpets, canteens and water tanks, and provision and powder bags.

In consequence of the introduction of the hard compounds and other new fabrics, a new field is now opened for the manufacture of various military articles that have not been heretofore attempted. Owing, also, to the invention of vulcanizing in moulds, many of these articles that have formerly been made of sole or harness leather, may now be made by this process, and they

are a class of articles for which no objection can be raised to the use of gum-elastic. Among these are pistol holsters, sword sheaths, cartridge boxes, &c. some of which are hereafter described.

MUSKET COVERS.

Musket covers are manufactured of the plated gum-elastic fabrics, and are secured in the usual way by buckle and strap, or by tying, see plate xii., fig. 1. When fastened by the whalebone slide, as represented by fig. 2, and inflated by the self-acting valve tube, they are not only sufficiently buoyant to float the gun or rifle, but will also answer in a good degree as a life-preserver to the sportsman or soldier, in crossing a river. This article, when used together with the canteen, made with the valve, as represented plate , fig. , is quite sufficient to buoy up a man in the water.

WAGON FLOATS.

These are the invention of an officer* of the United States' army.

The India rubber cylinders are used in pairs with apparatus, represented in plate , by which loaded wagons are easily floated across rivers.

The cylinders may also be used for rafts, and for making floating bridges, when placed at suitable distances from each other, and anchored.

A complete set of these have been furnished to the United States government, for the army.

For a more particular description of the use of these floats, the reader is referred to Col. Stanton's Specification of Patent, United States' Patent Office. See plate , fig. .

* Col. Henry Stanton.

AMBULANCHE.

This is an invention for the purpose of transporting the sick. It consists of a mattress or sacking of perforated elastic compound, or of ventilated quilted fabric, as represented, plate , fig. . It is arranged so as to be supported by elastic springs, and may be suspended by different methods, on wood or metal frame-work, or laid upon the ground to suit the convenience or comfort of the patient. As yet, the writer has had no opportunity of testing the utility of this article; he, however, submits it as worthy the attention of military men. "The use of gum-elastic for this purpose was first suggested by an officer of the United States' army."

POWDER BAGS.

These are made of coated canvas, plated and corded fabrics, or vegetable leather, and are used in the army and navy instead of barrels, for containing powder. When the mouths of these bags are secured by the metal fastening, as represented in plate xii., fig. 3, powder will remain dry in them although kept under water.

PROVISION BAGS.

These are made of corded and barred fabrics, or plated canvas, with eyelets to lace, and also with an apron, or extra mouth-piece, as represented in plate , figs. 1 and 2, which falls inside when laced, or is drawn out and tied when it is designed to make the mouth water-tight, or to cause the bag to hold an extra quantity. These bags are useful not only for provisions, but for other merchandise and for papers, to protect them from

loss or damage by water. When the mouth is tied quite tight, these bags may be left in the open field, and even under water, with safety. They were extensively used and approved by the troops of the United States government during the Mexican war.

PISTOL HOLSTERS.

Pistol holsters are manufactured of caoutchouc whalebone combined with vegetable leather. See plate , fig. . The advantages claimed for this article over leather are cheapness, keeping their shape under all circumstances, together with their water-proof qualities.

PORT-FIRE CASES.

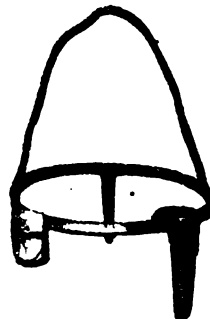
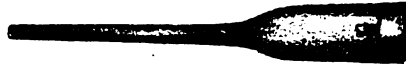
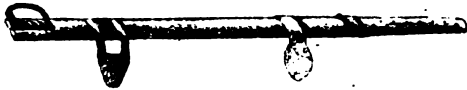
Port-fire cases are manufactured of caoutchouc whalebone or whalebone board. See plate , fig. .

CANNON COVERS.

These are made of plated, corded, and barred fabrics, and are designed to be used instead of pent-houses, to protect guns when mounted, and their carriages, from the effects of the sun and weather.

SWORD SHEATHS.

Sword, bayonet, and knife sheaths are made either of caoutchouc whalebone or whalebone board. Their great superiority over leather consists in their cheapness, durability, and in not being so liable to get broken by being bent as leather. See plate xii., fig. .



CARTRIDGE BOXES.

Caoutchouc whalebone and felt are suitable substances from which to manufacture cartridge boxes, of different kinds, using the felt for the belts and other flexible parts, and the whalebone for the parts that have commonly been made of wood or metal.

CAMP BLANKETS.

These are made of napped plated cloths, felt, or corded and napped vellum. They may be recommended as an invaluable article for the soldier, or others who are obliged to sleep on the ground, or are in any way exposed to storms.

CANNON SPONGE COVERS.

These are made of plated cloth or corded vellum, and are used as a cover for sponges that are used in cleaning cannon.

SWORD AND PISTOL COVERS.

Are made of plated fabrics, and are either fastened by buckle and strap, as represented, plate xii., fig. 6; or they are made water- and air-tight by means of the clasp, as represented by fig. 7; by which means, as in the case of the musket covers before described, they are made water and air tight, and the atmosphere is excluded from the arms, so that they are prevented from rusting.

MILITARY BELTS.

A variety of military belts are made of gum-elastic felt and vegetable leather, manufactured after the manner described for other belts and straps, Chapter

CANTEENS.

These are made of plated cloth, *corded vellum*, or *vegetable leather*, of various patterns and sizes. The crescent shape, represented in plate , fig. , is considered best for the sportsman or soldier, because it does not roll or shift about when suspended upon the person, like some other forms of this article.

Canteens of various patterns are also made of caoutchouc whalebone, but these are more properly described as flasks and bottles in another chapter.

WATER TANKS.

These are made of corded and barred vegetable leather, either single or double, in the manner represented by the drawing in plate , figs. . They are only a larger kind of water bottle, designed for the transportation of liquids of any kind, so trimmed that they may be conveniently handled, or transported on horseback like saddle bags. They were extensively used, and with entire satisfaction, by the United States' troops during the Mexican war. This method of transporting liquids is returning to primitive customs which still prevail in the East, except, that instead of skins, vegetable leather, which is far better, is used.

MILITARY CAPS

May be manufactured in different ways, of any shape desired, of caoutchouc whalebone combined with other gum-elastic fabrics.

Those parts of the cap which are required, may be made soft, like cloth or felt ; and other parts hard, like leather ; while bands of steel or metal may be inserted in their manufacture over the top, to protect the crown from sabre cuts, as represented in plate , fig. ; or wire-work may be inserted in the crown in the manufacture of the article at small expense. With or without these appendages, two important objects are attained in these caps, lightness and strength, and it is believed that by this combination of the fabrics, the article so long desired by military men is obtained.

BLASTING CARTRIDGES.

Are made of elastic compound, with a tube of the same material of any desired length, for the purpose of blasting rocks under water, and for dry blasting, particularly where the bore is to be filled with wet substances. Those acquainted with blasting, and with the properties of this material, will readily perceive the advantages to be gained by cartridges like those proposed.

BUDGE BARRELS.

See Chapter

Naval and Maritime.

TENTS AND TENT CARPETS.

See Chapter

BANDAGES.

See Chapter

MILITARY STOCKS.

Since the invention of the perforated fabrics, and the improvement of gum-elastic in relation to odor, among the other articles of ordinary wearing apparel to which gum-elastic is being successfully applied, perhaps no one is more appropriate than that of military stocks. They are, like gum-elastic over-shoes, formed upon lasts, upon which they are vulcanized, consequently they will afterwards retain their shape, will be cool and pleasant, and will be exceedingly durable.

HAVERSACKS.

These are manufactured in two apartments, similar to gum-elastic fish-bags, one of which is made of the perforated, the other of the water-proof fabrics; consequently, the articles in one of them will be protected from wet, and those kept in the other will have the advantage of a circulation of air. See plate fig. .

KNAPSACKS.

Among the first military equipments made of gum-elastic, were knapsacks; they were found objectionable in consequence of their too great warmth, offensive odor, and imperfect manu-

facture. The first objection is removed by perforating different parts of the knapsack; the second, by a change of ingredients in the compound; and the last, by skill and experience in the manufacture. See plate , fig. .

MINERS' KNAPSACKS.

This knapsack is manufactured of gum-elastic plated cloth or vellum, upon the same general plan as the knapsacks before described, with the addition of apartments for the miner's tools.

GUN AND PISTOL STOCKS.

Caoutchouc enamel and ivory are admirably adapted, either alone or in combination with iron or wood, for pistol and gun stocks, and also for the handles of other military weapons generally. There is also an important economy in the manufacture of these substances for these purposes, because they are moulded into the different forms, either plain or ornamental, with trifling labor without waste of material.

AIR PONTONS AND PONTON BOATS.

India rubber pontons and ponton boats, by which is here meant all such as are made of India rubber fabrics filled with air only, were among the first things made of gum-elastic by different manufacturers.

The attention of the United States and other governments was early drawn to them, as being inventions deserving of encouragement. They were favorably noticed, and orders were given by the United States government for supplies, as then manufactured, of native gum. In the commencement of the manufacture of the vulcanized fabrics, orders were repeated for supplies of the vulcanized pontons; but they have thus far failed to be as useful as was anticipated.

The objections which apply to boats and pontons made of gum-elastic fabrics (uncombined with other materials, for staying and stiffening them) and filled with air only, are the following, viz. : They require to be filled with a hand bellows, which is an inconvenient and laborious process. A very small leak will cause them to collapse and sink. These difficulties are overcome by combining the vulcanized fabrics with other materials, in the manner specified in this work for constructing self-inflating air-work. See Chapter , p. .

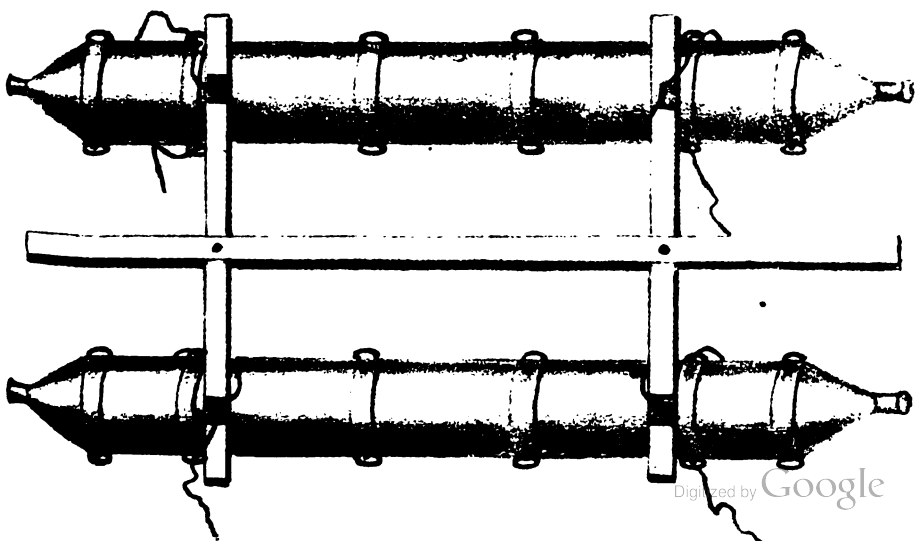
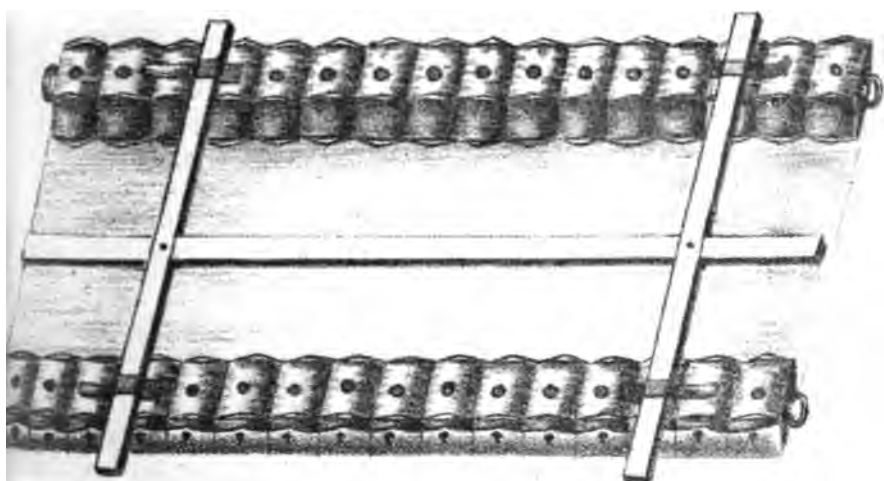
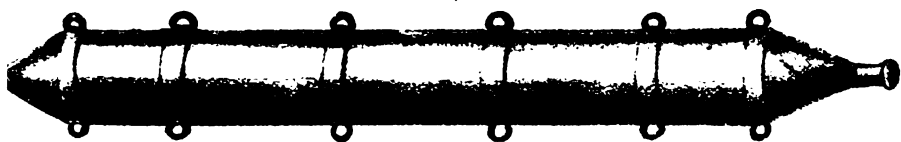
From these descriptions, and those given in the chapter on self-inflating pontons, the improvements here alluded to may be understood. A brief description is here given of a few of the many forms of pontons and boats which are filled with air only ; not for the purpose of recommending them, but for the purpose of giving an idea of the origin of articles of this description.

AIR PONTONS.

The air ponton above alluded to as ordered by the United States, was made of coated canvas, in three compartments cemented together, as represented, plate , page , each compartment being inflated by a separate tube, forming together a raft or boat about six feet wide and eighteen feet in length.

PONTON AIR BOAT.

This boat is formed of a series of air-tubes or cylinders, each of which is inflated with a separate tube. This, together with the ponton above described, may be considered the best among the many kinds of air pontons and boats designed to be filled with air only. See plate , fig. .



AIR BALSOR.

Fig. , plate , represents a balsor or single air cylinder, one of the earliest manufactures of the Roxbury Company. They were made of India rubber canvas, and inflated by a hand bellows. They were designed to be used as a life-spar or buoy, or to be fastened to boats to keep them from swamping. These, as well as the other articles in which air alone is relied upon for their buoyancy and safety, are unsafe and not to be depended upon compared with the self-inflating pontons and boats specified in Chapter XXX. They are here noticed because they were the first of this kind of work, and because they are the cheapest made, and would answer a good purpose in the absence of better things.

AIR PONTON RAFTS.

These may be constructed either of the air balsors or wagon float cylinders. For this purpose they are connected together in the same way as the self-inflating ponton rafts, more particularly specified, Chapter XXX. They are more cheaply made, but not so convenient or safe as the self-inflating ponton rafts. See plate , fig. .

CHAPTER XI.

NAVAL AND MARITIME.

Ships' sails. Report of Captain Popham. Second report of Captain Popham. Ship lights. Tar-paulins. Ships' water tanks. Hammocks. Tomplon. Signal balls. Camels, or vessels' lighters. Submarine armor. Ships' letter bags. Bread bags. Sailors' bags. Budge barrel. Fenders. Navy belts. Sheaths. South-westerns. Tarpaulin hats. Deck scrubs. Gun recoil springs. Shot plug. Life buoy. Harbor buoy. Anchor buoy. Whale buoy. Anglers' floats. Decoys. Seine floats. Sheathing and caulking materials. Bathing tubs. Ships' buckets. Ships' ware and utensils. Seamen's wearing apparel. Improved hatch. Boats. Whale-boats, yawls, jolly-boats, and row-boats. Long-boats. Club-boats and race-boats. Life boats. Ballast tanks.

It is not to be expected that one unacquainted with a sea-faring life, should be able to enumerate, and much less to describe minutely, all the various articles that might be made for ships' use, or that might properly be classed under this head. Those who are acquainted with the subject, and the wants of seamen, will doubtless suggest many other uses, as well as improvements in the construction of those articles that are now made of the gum-elastic fabrics.

SHIPS' SAILS.

The first gum-elastic ship's sail was a top-sail, which was made by the writer in 1844, and was intended for the packet ship Patrick Henry. After the sail was completed, it was thought that the coated canvas of which it was made was so very light, that it was imprudent to make trial of it. It was, therefore, stored at the warehouse in New York until 1845. At this time, the clerks at the warehouse, in a frolicsome mood, and not knowing why the sail had not been tried, had it bent upon the Liverpool packet ship Stephen Whitney; and, for a surprise to

the writer on the day of sailing, gave him an invitation to go to sea under an India rubber sail. His first emotions were those of displeasure at the conduct of the clerks, but it was too late to unbend it, it fitted well, and it was with feelings mingled with regret, hope, and fear for the result of the first experiment of so important an application, that the writer saw the sail set, and, outside the bay, filled with a stiff breeze.

This sail was made of a cloth very inferior to the light sail duck, and was banded in the same manner as that represented by the plate. The performance of this sail, considering the quality of the canvas of which it was made, as appears from Capt. Popham's reports, was matter of surprise.

Notwithstanding the favorable nature of these reports, the writer was aware that these sails were heavier than would be desirable, as the goods were then made. Since that time the improvement in this respect is such, that the article now appears to be quite unobjectionable.

The sail was taken off before the loss of the Stephen Whitney, and sent to Washington for inspection.

The question will naturally arise, why an improvement of so much importance should so long remain without further notice? It may be answered that the best things often remain unnoticed from the fact, that circumstances exist adverse to their introduction; and it sometimes happens that the advantages promised by particular things are so great, as in themselves to stagger belief, and excite incredulity. Such would appear to be the case in reference to the use of this substance for ships' sails, and this application has undoubtedly been delayed chiefly on that account.

It was not, however, wholly unnoticed as has been generally supposed. Orders were given by the government for several suits of these sails, through Col. Staunton, who superintended the equipment of vessels for the Mexican service. The principal reasons why the orders were not executed, were these: Orders

for quantities of smaller articles, the manufacture of which was more lucrative to the licensees, were being executed at the time for the government. The manufacture was not then sufficiently advanced as to the extent of the heating or vulcanizing apparatus, for the manufacture of sails. The substituting of the fibrous cotton fabrics for this use instead of duck, will not only lessen the expense so as to make the sails cheaper, but when corded and barred, will also make them stronger than duck.

Their being made white will give them almost exactly the appearance of other sails. Owing to the advancement of the manufacture, the article has been greatly improved since the sail for the Stephen Whitney was made, being manufactured much lighter, and more complete in many respects. It is certain that there can be no loss of power by the escape of wind through these sails, consequently, the spread of canvas required will be much less; and vessels with these sails will be less difficult to manage, and much more safe. Increased strength may be gained by cording the sail with large twine, and by making the bars of linen web. In this way an almost impassible barrier is presented to the tearing of the sail beyond each bar; whereas, a sail of duck, when it begins to tear is often rent the whole length or breadth.

The comparative durability of the two kinds of sails is too obvious to be discussed; but the superiority of the gum-elastic sail, not being liable to mildew and decay like canvas, may be noticed.

The peculiar property of these sails, and one upon which emphasis may be placed in describing it, is pliability. They will not stiffen and freeze, as will be seen in the report of Capt. Popham; and any one may easily ascertain by trial, that ice will not adhere to gum-elastic fabrics. This being the case, the danger is less, and much labor and hardship in working them is saved.

This is perhaps the most extensive and important of all the applications of gum-elastic, is one of national interest, and the subject is worthy of an abler pen. The writer would here

appeal to all whom it concerns, not to leave unheeded that which so deeply affects the interests of mankind.

Plate xi., fig. 1, represents sails that are made of barred coated canvas, such as was tried upon the *Stephen Whitney*. Plate xi., fig. 2, represents sails made of the corded and barred cotton fibrous fabrics, with which experiments are now being made for sails, which it is believed will answer better than duck, on the score of both cost and quality.

REPORT OF CAPTAIN POPHAM.

NEW YORK, *January 9th*, 1846.

MR. CHARLES GOODYEAR.

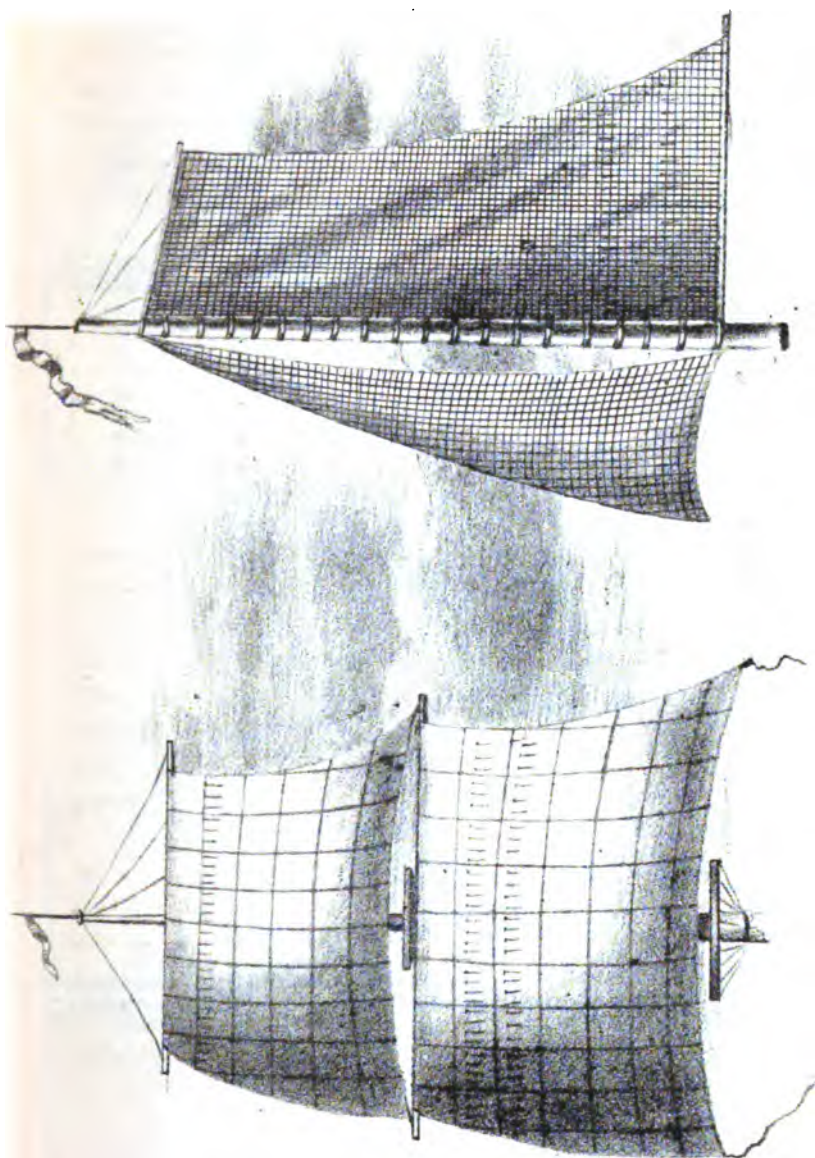
Dear Sir,

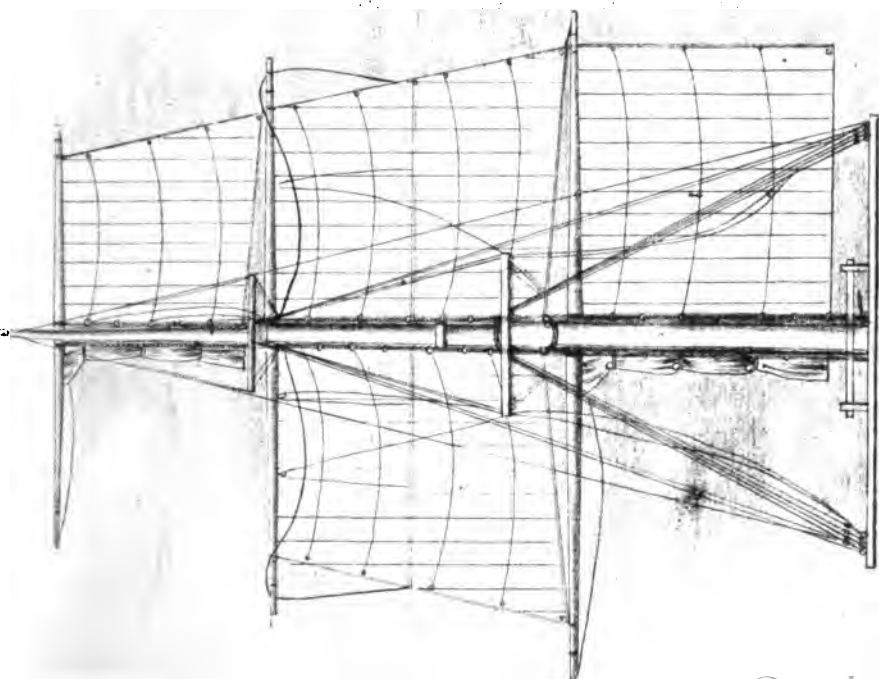
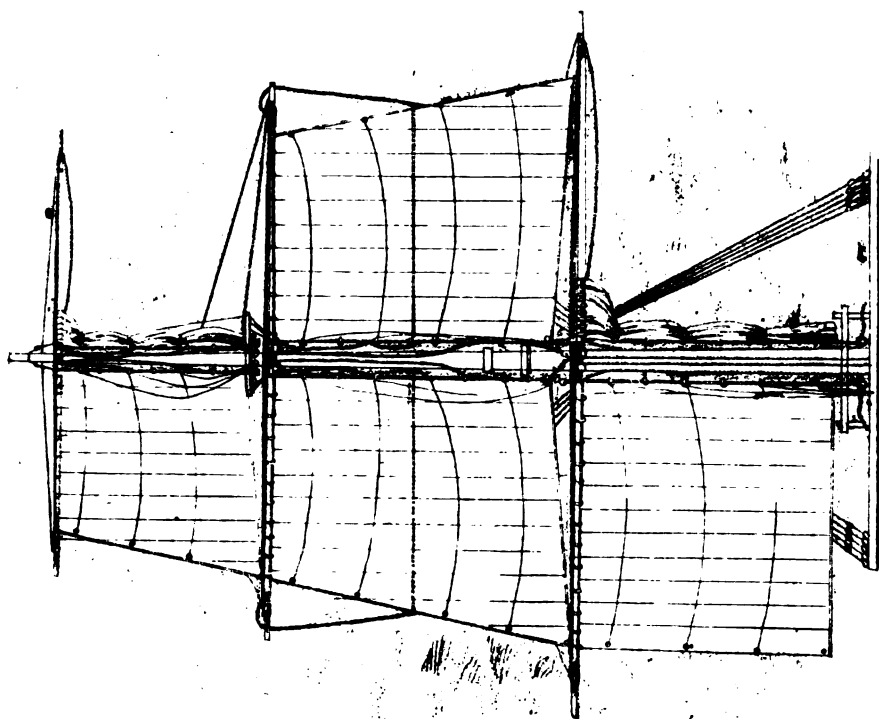
It gives me pleasure to say, in reply to your letter, I can state decisively that your metallic India rubber canvas is a superior article for ships' sails, and especially for heavy and storm sails.

The topsail in question was put on the packet ship *Stephen Whitney*, in May, 1845, since which time it has been constantly and severely tried during three passages across the Atlantic, both winter and summer. Among its many good qualities, that of its remaining pliable and clear of ice when other sails are frozen and stiff, is deserving of special notice

I shall be able to speak further of its durability, if it ever wears out. That a canvas so inferior as this was, before it was covered with your gum-elastic, should endure service as this has, is to me a matter of surprise.

CHARLES W. POPHAM,
Of Ship Stephen Whitney.





SECOND REPORT OF CAPTAIN POPHAM.

NEW YORK, *May 9th*, 1846.

CHARLES GOODYEAR, ESQ.,
New Haven.

Dear Sir,

With much pleasure I again reply to your inquiries respecting the patent India rubber sail. It has now been with me six successive trips across the Atlantic, and I can assure you has received no favor. It appears to me to possess great durability, is easily handled in wet or frosty weather, not being stiffened in the least degree by either the one or the other, and is also not liable to mildew.

I consider your invention valuable to all engaged in ocean navigation.

I am, dear Sir,

Yours truly,

CHARLES W. POPHAM,
Of Ship Stephen Whitney.

The sail was taken off before the loss of the Stephen Whitney, and sent to Washington for inspection, when the orders for sails for government vessels before alluded to, were given by Col. Stanton.

SHIP LIGHTS.

The use of gum-elastic for¹ ship lights is the invention of another,* for which he obtained letters patent. The improvement in this article consists in placing a cushion, or packing of gum-elastic, around the metal sash upon which the lid or cover of the light shuts, for the purpose of keeping out the water in rough weather, the importance of which will be readily perceived. The construction of these lights may be better understood by reference to plate , fig. .

* Mr. Enoch Hidden, New York.

TARPAULINS

These are made in the form of hatch covers, hammock covers, and other articles, of corded and barred vellum, and the plated fabrics.

For this use, as well as all others, when the fabrics are constantly exposed to the action of the sun and weather, a large proportion of carbon or lampblack is required to be compounded with the gum.

At the time of the first manufacture of the vulcanized fabrics for such purposes as the above, this fact was not known, and the articles did not prove as good as was expected; but it has since been proved beyond a question, that with the addition of carbon, this objection is removed. The fabrics are yet further improved in this particular, by giving them a surface coat of caoutchouc, compounded with shellac.

SHIPS' WATER TANKS

Are made of corded and barred plated fabrics, in the form of a barrel, with or without a hose and stop-cock attached, as represented in plate , fig. .

It is satisfactorily proved by long trial, that water may be kept in these vessels a great length of time without injury. Another great advantage they have is that of compact storage, and of more convenient transportation than barrels, or other wooden or earthen vessels, for taking water on board from the shore by boats. It is apparent that these tanks may be made of any dimensions for containing water on shipboard, and that their buoyancy when filled with air instead of water, might be made available on many occasions in forming life boats or rafts.

HAMMOCKS.

Hammocks are manufactured of the perforated and quilted fabrics, described Vol. I. They are well suited for ships' use. The superiority claimed for them consists in their cleanliness. They do not require to be scoured, and are not liable to be infected with vermin. The article is made more complete by the addition of a sheet of napped vellum, of the size of the hammock, which may be drawn underneath it in winter, so that the article when arranged in this way, may be considered warmer in cold weather, and cooler in hot weather than other hammocks; and if the perforated gum-elastic compound is used, (instead of the other fabrics which are not elastic), a hammock is formed as comfortable as can be desired, although it will be more expensive than that made of the non-elastic fabrics. See plate , fig.

TOMPION.

The outer surface of this article, for the depth of about an inch, is made of gum-elastic sponge; within it is filled with air or light wood, and is designed as a substitute for the wood tompion, which has been heretofore used. Its use is to keep cannon dry and free from rust. This is the invention of an officer, formerly of the United States' Navy;* it is evidently an improvement, and may be termed a perfect cannon cork.

SIGNAL BALLS.

These are made of plated fabrics, about three feet in diameter, and are constructed in the same manner as the self-inflating globes before described. They are designed for signals for.

* Lieut. Seeley.

use, and were first made of gum-elastic, by order of Commodore Smith, of the United States' Navy, for the use of government vessels.

CAMELS, OR VESSELS' LIGHTERS.

This use of gum-elastic is the invention of another,* as patented by him in the United States, for lightering vessels in shoal water. They are made of corded caoutchouc fabrics, surrounded by a rope netting, and are applied to the vessel in the manner represented, plate . Several sets of these camels have been ordered for the United States' vessels, for experiment.

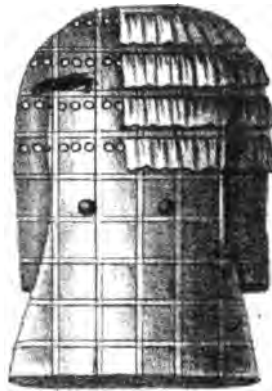
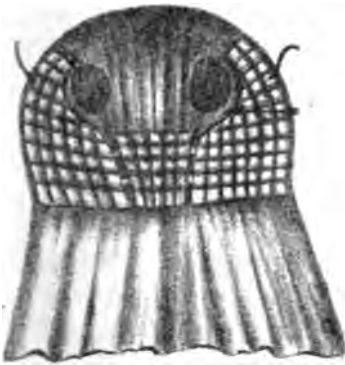
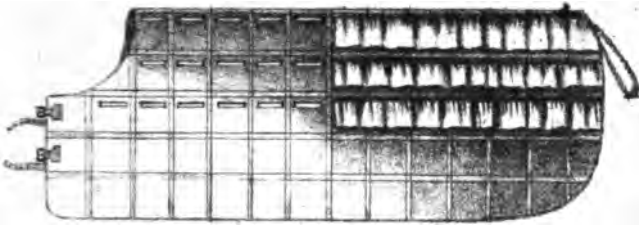
SUBMARINE ARMOR.

This consists of a dress and apparatus, made chiefly of vulcanized gum-elastic fabrics, an idea of which may be obtained from the plate. This armor was invented and patented by the patentee of the ships' camels, described above.* It was designed as a substitute for the diving bell, and was also intended by the inventor to be used for pearl diving, for which purpose there is good reason to suppose it might be used to advantage. See plate

SHIPS' LETTER BAGS.

These are made in the same manner, and of the same materials, as the mail-bags, described page , except of a larger size; the value of this article for the preservation of life and property not commented upon here, as this is more particularly and under the head of Articles for the Preservation of Life

* Capt. George W. Taylor.



and Property, Chapter . Another article of this kind is made with an air-tight clasp, and tube for inflating it, see plate , figs. 1 and 2.

BREAD BAGS.

Are made in the same way as ships' letter bags, of gum-elastic fabrics ; they are designed for containing bread for ships' use, instead of barrels, by which means bread may be kept dry, and room saved in storage.

SAILORS' BAGS.

These are made of plated cloth, or corded vellum, with water-tight mouth pieces, in the same way as the grain bags, described page . They are made of different sizes and proportions, and without handles, but commonly of the proportions required to answer the United States' Navy regulations, where they have been used with success.

This article is designed not only to answer the purpose of a clothes bag, but also to render any boat, even though it should be leaky, a life-boat, which may be done by lashing to the boat a number of them filled with clothing.

BUDGE BARREL.

This is a light cask or barrel, made of whalebone board, with wooden hoops, as represented in plate xii., fig. 1 ; it is an article which has heretofore been made of leather, and is used for the safe keeping of cartridges on deck during an action.

FENDERS.

Boat or vessel fenders are made of gum-elastic sponge, either in the form of a ring or cushion, see plate , fig. , or they are made of heavy vegetable leather, and inflated with air, as represented, fig. , in which case they form one of the assortment of articles for the preservation of life for ships' use.

NAVY BELTS.

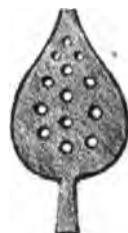
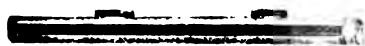
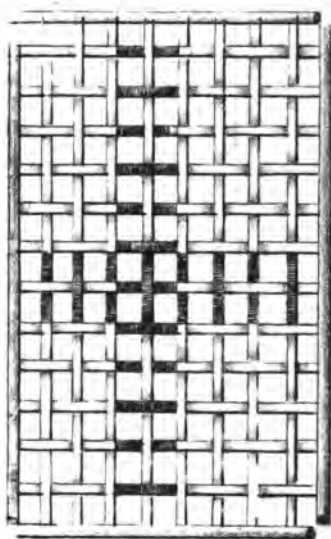
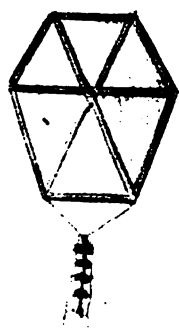
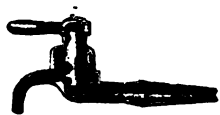
These are made of vegetable leather, with pockets for cartridges, and appendages for the knife or sabre, and revolver. See plate xii., fig. 2.

SHEATHS.

Knife and sword sheaths are most completely made of caoutchouc whalebone and whalebone board. This substance is peculiarly adapted for this use, and particularly on shipboard, both on account of its pliability as well as water-proof qualities. See plate xii., fig. 3.

SOUTH-WESTERS.

This is a cap made after the pattern well known to fishermen and sailors by the above name, as represented in plate , fig. . They were formerly made of painted canvas, instead of which those made of India rubber fabrics are fast coming into use.



TARPAULIN HATS.

Are best made of vellum or vegetable leather. They are much lighter, and much more durable than those made of painted canvas, but whether they will be adopted by Jack instead of the article made by himself, during his leisure moments, is a matter of doubt.

DECK SCRUBS,

Or what are termed by sailors Squeal Gees, are made of a plate of caoutchouc packing, such as is used for engine packing, or of gum-elastic sponge. This article has already been made by one of the licensees* to considerable extent, and has been found to answer the purpose for which it is used, completely. See plate vi., fig. 7.

GUN RECOIL SPRINGS.

The strain and injury done to vessels of war by the recoil of the guns, is an evil for which a remedy has long been sought. For this purpose it has been proposed to use springs of gum-elastic, acting either by extension or by compression: in either case, various methods may be suggested for applying them to the gun carriage. See plate , fig. .

* Mr. John Greacen, 96 Broadway, New York.

SHOT PLUG.

As this article appears to be deserving of special notice, and one that would not be likely to be understood without particular explanations, a description of it is given in full from the inventor's* advertisement, which is as follows:

"This invention is, without doubt, one of the most perfect, ingenious, and valuable articles ever patented in the world; and for simplicity and usefulness, unequaled for the purposes intended, viz.: for stopping the holes made by cannon balls in the sides of ships, and for other purposes, as named in the following description. Fig. 1, plate , represents the Shot Plug, in a contracted state, and ready for immediate use. In time of action, it requires the attention of but one man in each wing of the vessel, as in a few seconds the plug can be thrust through the hole, as soon so the ball enters. The ring is then drawn off by the lanyard attached, it then expands by a spring, and forms a flap-valve, which is acted upon by the pressure of the water from without, and securely fastened on the inside of the ship, no matter how much splintered, by the buckler and screw on the end of the shaft, thus forming an impregnable barrier to the entrance of water.

The advantages this Shot Plug have over the old conical or wooden plug are various. It supersedes the necessity of sending carpenters over the sides of vessels, when in action, to insert the wooden plug, whereby they are continually exposed to the enemy's sharp-shooters, and frequently lose their lives; and when the ball enters below the water-line, the hole cannot be stopped from without, but is secured in the best way possible on the inside, by the substitution of oakum, tallow, or any thing that comes handy, and never can be made tight.

Another feature, and a very important one in this invention is, that when inserted it does not retard the sailing qualities of

* Lieut. Beely.

the vessel. The conical wooden plug always projects from the side of the vessel one or two feet, necessarily retarding its motion in a very great degree. It also has the advantage of deceiving the enemy, as it can scarcely be noticed either after or in being inserted.

This Shot Plug can also be used with the same facility in stopping air ports, or side lights, when by accident they are broken; dead lights, horse pipes, when the cables are unbent; pipes passing through the sides of steam vessels, which are liable to injury; also holes caused by snags, or other accidents of the kind.

Fig. 2 represents the Shot Plug in an expanded shape, and is better described and explained by the following remarks, having reference to the letters designating its different points from A to G.

A is the conical head into which the outer end of the shaft is screwed. It is made of cast iron, in the shape of a cone, and of sufficient size in length and breadth, having a circular cavity in its large end, forming a curb or ring, for the purpose of receiving and protecting the joints of the springs, and forming a shoulder or stop, against which the wings strike when expanded.

B is a centre plate or ring, circular or many-sided, to which a number of springs are attached, having an opening in its centre to admit the shaft, over which said plate or ring is slipped, and secured by the head and shoulder, as represented in description A.

C is ten or more slightly curved radial springs, of any desired length, hinged to the central plate B, made flat, and slightly tapered and widened outwardly, and also curved at their extremities, to prevent their catching in the ship's sides.

D is the central cylindrical shaft, which is passed through the circular plate to which the springs are hinged, and screwed into the conical head represented by A. This shaft has a screw cut on each end: one for the conical head, the other to receive the wrench by which the shaft is drawn inward through the buckler, represented on the shaft of the contracted Shot Plug in first cut.

This shaft is jointed at the upper letter D, so as to admit of its being applied with the same facility, and effectually stopping the leak from a shot hole, no matter in what direction the ball may enter the ship.

E is a circular vulcanized spring, made of stout, heavy India rubber packing, possessing sufficient power to force open the springs attached to the centre plate or ring, causing the flap-valve to expand, and immediately cover the hole, effectually shutting out the water in an instant.

F is a circular sheet of vulcanized India rubber cloth, attached to and covering the radial springs, with a hole in the centre sufficiently large to admit of the shaft passing through, to be attached to the conical head.

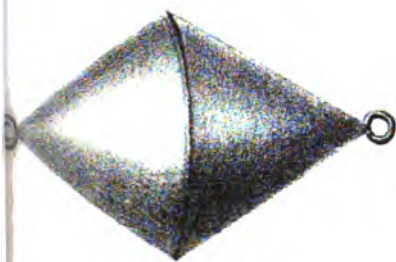
G is a circular ring, with lanyard attached. This ring is represented in the first engraving, placed in its proper position on the Shot Plug, to prevent its expanding before passing through the shot hole. It brings the entire springs and covering into a compact and proper shape, to protect the cloth from splinters, or from being torn in passing through the cavity. After the plug is thrust through, the ring is drawn off by the lanyard, the springs expand, and the pressure of the water, and use of the screw and buckler, secures it tightly, and excludes the water as effectually as though the hole was boarded and caulked.

SAMUEL J. SEELY."

LIFE BUOY.

This is made of any required shape or dimensions, of vegetable leather, in the same way as self-inflating air work. It is inflated by a self-acting valve tube, and when thrown overboard, being attached to the vessel by a rope, it will become self-inflated.

This is an article which may be recommended to be kept as a life buoy on the deck of all vessels. See plate , fig. .



HARBOR BUOYS.

It has been suggested that harbor buoys may be constructed of vulcanized whalebone board, with economy and advantage, especially for southern latitudes, where wooden buoys are exposed to the ravages of insects. The metal buoys which are now used are very much heavier, and much more expensive than they would be, made of gum-elastic cord ware. The writer has no doubt as to the success of an article of this kind, if properly made of this material in this way. See plate xi., fig. .

ANCHOR BUOYS.

These articles are made of plated canvas or whalebone board, with a ring at each end working on a swivel. For ships, the size is commonly about three feet in length and eighteen inches in diameter, of the shape represented in plate xi., fig. 7.

WHALE BUOYS.

Are made of vegetable leather, or cord ware, about fifteen inches in length and eight inches in diameter, with a wooden block at the end through which the harpoon line is passed. A tube is also inserted in the block with which to inflate them. This article is fast displacing the leather ones formerly used by whalers. The object for which it is used is to save the harpoon and line when the whale is missed in harpooning. See plate xi., fig. 3.

ANGLERS' FLOATS

Are made of elastic compound, after the manner of hollow ware. They are designed as a substitute for the small wooden and cork buoys that are commonly used with fish lines. See plate xi., fig. 4.

DECOYS.

These are made for sportsmen, of non-elastic compound or whalebone board, after the manner of hollow-ware and toys in moulds. See plate xi., fig. 8.

SEINE FLOATS.

These are made of whalebone board, of an oval shape, after the method of hollow ware. A tube or hose of the same material passes through the buoy, and is cemented to it at each end. The seine rope is passed through this tube in attaching it to the seine. The advantage proposed by these floats is lightness, for which reason the seine can be more easily dragged, and will not be worn by handling, as in the case of wooden floats, which become water-logged and heavy, see plate xi., fig. 5.

SHEATHING AND CAULKING MATERIALS.

See Chapter

Packing, Sheathing, and Caulking.

BATHING TUBS.

See Chapter Bathing Apparatus.

SHIPS' BUCKETS.

See Chapter Ships, Camp, and Kitchen Utensils.

SHIPS' WARE AND UTENSILS.

See Chapter VII.

SEAMEN'S WEARING APPAREL.

See Chapter Wearing Apparel.

IMPROVED HATCH.

The hatch of vessels may be improved and rendered safe and water-tight by the use of vulcanized India rubber packing set around in the sill of the hatch. A projection or ledge is formed upon the hatch cover, which shuts upon the packing when the hatch is closed, by which means it is made perfectly water-tight.

BOATS.

The magnitude of the consequences depending on the proper construction of boats and vessels, demands that all should be done that is possible to this end, and although apparently all has been achieved that could be, with the materials that have been used in the ordinary methods of construction, yet it is more than probable that with other materials and methods of combining them, further improvements will be made in this art. That the caoutchouc fabrics, whalebone and whalebone board, are the new materials with which boats of different kinds will be greatly improved, there is good assurance. The strength and elasticity of these materials, together with their extreme lightness, renders their usefulness for this purpose a matter of certainty. In the building of large boats, such as ships' long-boats, their strength will be increased by the use of the whalebone board, in the form of tubes, in the manner hereafter described and represented in plate . For other boats, this substance is strong enough in the form of sheets, much stronger than any kind of wood of the same weight ; nor is it necessary to give it a tubular form for boats of any size, except to make them much stronger than wood, with the least expense.

In making suggestions for the adoption of new materials, and new combinations of them, for the building of vessels of a large class, some circumstances which have led to these suggestions are stated, lest it should be thought that the subject is wholly foreign to the writer's occupation.

It is so ordered as a general rule, that individuals of one occupation cannot easily encroach upon that of others, or make improvements in branches of business with which they are disconnected.

There are, however, exceptions to this rule. As some nations are so strongly attached to particular customs, and fixed habits of thinking and acting, as almost to prohibit all advance in science and the arts among them, so different classes of trades

and mechanics sometimes become so wedded to the method of doing things in the way they have been taught, and their interests become so blended with the existing state of things, that of all persons they are least likely to discover any improvement that produces a change, or makes an innovation in their branch of business.

An observer, whose mind is free from bias of any sort on the subject, may therefore, in some cases, by research, and by applying his energies to a single point, come in possession of advantages, connected with his experience in other matters and pursuits, which more than counterbalance the disadvantages under which he labors, for the want of knowledge of the new art or profession in which he engages.

The year before the writer commenced his experiments with India rubber, he was occupied with attempts in the improvement of boats, by constructing them of metal tubes upon a plan very similar to the one hereafter described. A difficulty was then found in combining and securing the tubes together, so as to make them water-tight. The improvements in caoutchouc manufacture, consequent upon the discovery of the vulcanizing process and the invention of the whalebone board, render the manufacture of boats upon this plan now both practicable and simple. When the art of forming metal tubes shall be sufficiently advanced, so that they may be readily shaped to the model of a vessel, it is believed, that by the method of combining them, represented plate , vessels may be built of metal tubes or cylinders instead of sheets or plates of iron as heretofore.

Since the time of the experiments before alluded to with metal tubes, in 1834, great advancement has been made in the art of building boats and other vessels of iron ; but this plan of using the iron in a tubular form, and particularly the method of uniting and binding the tubes, was then, and is even now, quite new.

As an argument from analogy in favor of this plan of building with tubes or cylinders, whether as applied to boats or ships, it may be said that the frame-work of the whole vegetable creation is cylindrical. The greatest portion of the bones of all

animals, and especially of birds, is of the same shape, and hollow. This is the form which the Creator has adopted in his works (as best exemplified in the case of birds), where strength, speed, and buoyancy are requisite; why should it not be adopted in the building of vessels, where the same qualities are necessary?

At the time the writer made his experiments in boat-building with metal tubes in New Haven, in 1834, he firmly entertained the opinion of the correctness of this theory, and he is now fully convinced of its practicability, and that great improvements will be made in boats and vessels by this method of construction with tubes. These experiments were pursued during that year with the same ardor, and subjected him to the same kind of ridicule from those who witnessed them, as subsequently attended his experiments with gum-elastic.

These efforts at boat-building resulted in the completion of two sail-boats, each about fifteen feet long.

One peculiarity of this method of construction is, that each tube is used instead of a plank or timber in the ordinary way of building with wood. These tubes being each one hermetically sealed, the whole are united together in the manner hereafter specified in the article on long-boats, and as represented in plate . . . Another peculiarity is the use of metal, copper, or brass for the tubes, instead of iron. It is assumed that the increased strength of sheets of these materials, arising from their being used in a tubular form, will more than compensate for the difference in strength between them and iron, when iron is used in the form of plates, so that even the first cost could hardly be greater than that of iron as now used, in which case a vast economy is obvious. These finer metals used in the form proposed, could seldom be lost, even in the case of wreck they would float somewhere, and not being liable to corrode, like iron, the parts of an old vessel would always be of nearly the same value as when new.

It is not yet known to what extent caoutchouc may be used in the construction as well as the equipment of ships. Upon

this plan of constructing with tubes, it may be used in the construction of ships as well as of long-boats, when the supply of the substance shall be equal to so great a demand. Notwithstanding there is a sufficient supply in nature for such a demand, the means are not yet applied for gathering it to a sufficient extent. This plan of construction, however, is equally applicable, whether the tubes are formed of whalebone board only, or of sheets or plates of iron or finer metal covered with caoutchouc whalebone board. In the first attempts to build a vessel or long-boat, they would be constructed with less difficulty by continuing the tubes entirely around the model, and forming the bows and stern of plates of metal, as represented plate , figs. .

The foregoing suggestions are made for the consideration of those who may deem them worthy of notice, not doubting that at a future day they will receive attention. However speculative these views may appear to some, in regard to substituting these materials in vessels of a large class for timber, their correctness is already clearly demonstrated as applied to boats. A description of some of these is briefly given in this work.

The description of a variety of fancy and portable boats, and also of portable life-boats, are given in Chapter of this volume, the object is here only to describe those designed for common use for vessels, such as yawls, long-boats, row-boats, etc.

The hard compounds, whalebone and whalebone board, in sheets, (without being first made into tubes,) are strong enough for row-boats and the small boats of vessels. They are superior to boats made of wood, on account of their lightness and perfectly water-proof qualities, and may be made of one entire sheet of uniform strength.

The seams, of which there are but one or two in the covering of a large-sized boat, are the strongest parts of the work, being those parts in which wooden boats are most defective, and on which account chiefly they are unsafe, whereas boats of these materials are so cemented and united as to form one entire piece. This substance for boats may be described as a plastic wood, which, when in a soft state, may be shaped into any form

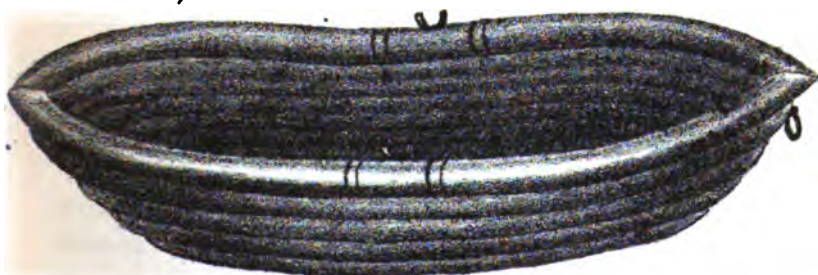
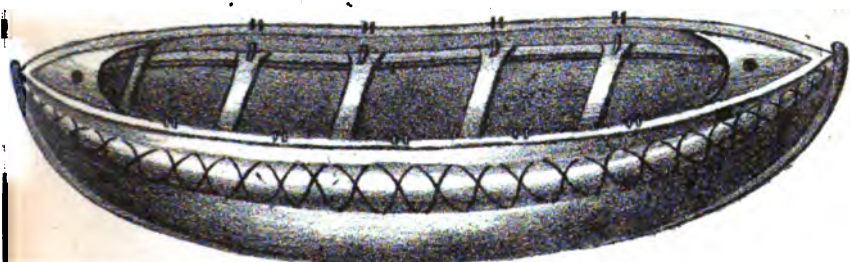
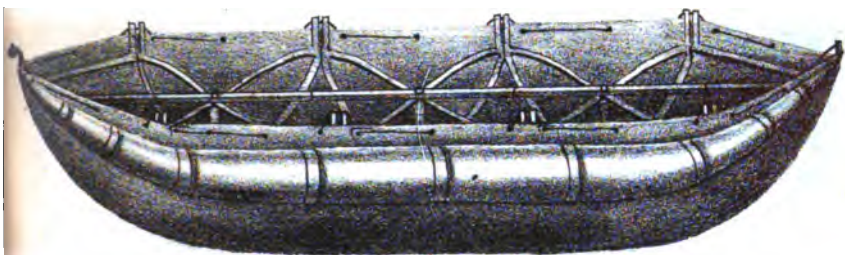
of uniform strength, in which form it is vulcanized, which form it retains with this advantage over any natural wood of the same bulk or weight. that it is harder, more elastic, and firmer. See plate , fig.

WHALE-BOATS, YAWLS, JOLLY-BOATS, AND ROW-BOATS.

All these various kinds of boats are made of the same materials, they are manufactured in the same way, and the same advantages appertain to them all in a greater or less degree, therefore the following description of the manner of their construction, with the plates, will serve to give an idea of the whole. The gunwale knees and keel are made either of wood or iron, and covered with thin whalebone board, or they are formed of tubes made of thick whalebone board. They are cemented to the boats after they are formed in the following manner:—The sheets of vulcanized caoutchouc whalebone board being made from one to two yards in width, and of any length desired, are cemented together upon the outsides of a form or model of the boat, in the same way as a shoe is formed upon a last, the keel being cemented on afterwards. The boat is then taken off and placed inside another form or mould of the same shape, when the parts before described are cemented to it, the whole is then vulcanized in the mould. See plate , figs.

LONG-BOATS.

Boats of large dimensions, and ships' long-boats, may be made stronger of these materials by first forming the whalebone board into tubes of from two to four inches in diameter, or of such dimensions as are best suited to the size of the boat. When put together, the tubes are shaped upon a model to the form of the boat, and cemented together. They are also cemented to the stem and stern pieces, each tube being made separately water-



tight. The spaces between the tubes are filled by triangular-shaped pieces of wood or battings, grooved so as to fit between the tubes. These pieces are placed longitudinally between the tubes, both outside and inside.

In order to make the whole structure water-tight, and to give the boat greater strength, these battings are covered with caoutchouc and cemented in their places. They also serve to form a smooth surface both outside and inside the boat. These battings are further secured by bolts passing through them and between the tubes of the boat. The gunwale knees and braces are secured in the same manner as the boats before described.

It will be perceived that this combination of the materials is such as to give the greatest possible strength with the least weight. This description may be better understood by reference to the plate, fig. .

CLUB-BOATS AND RACE-BOATS.

Caoutchouc whalebone and whalebone board are materials exactly suitable for the manufacture of club and race-boats, on account of their great strength and lightness, and the cheapness of their manufacture. Thin whalebone board may be used in general for club-boats, but caoutchouc whalebone will make the lightest and most completely finished race-boat. See plate , fig. .

LIFE-BOATS.

All the boats before specified are convertible into life-boats with trifling expense at the time of their manufacture, by the addition of water-tight compartments in the waste room in the bottom and sides of the boat, as also at the stem and stern, as represented by plate , figs.

The long-boats before described are necessarily life-boats, as they are first made of tubes, but they also may be rendered

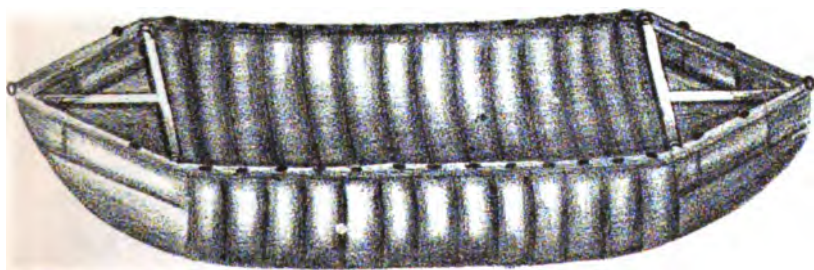
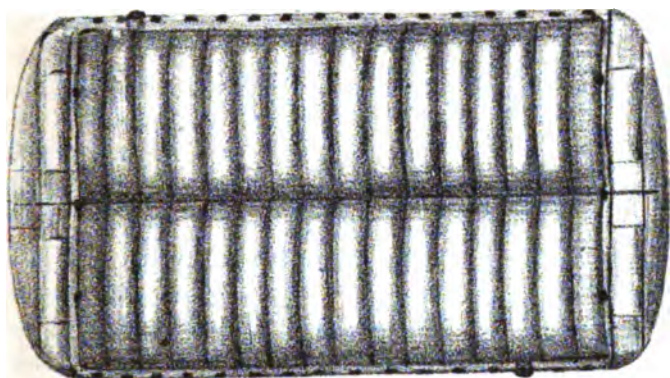
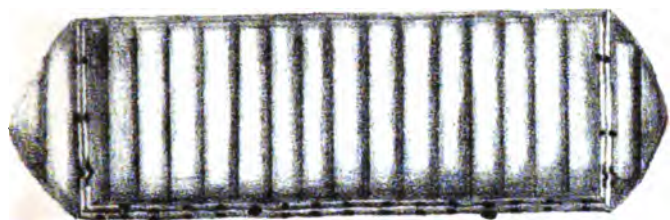
still more buoyant by the addition of compartments. See plate , fig.

For further descriptions of a variety of portable boats and portable life-boats, see Chapter

BALLAST TANKS.

It is suggested that an important improvement may be made in the method of giving ballast to boats and vessels, by the use of large tanks made of caoutchouc fabrics, to be placed in the bottom of the vessel or boat.

These bags may be so arranged with connecting hose, that the water may be pumped in and out. At the same time the fresh water of the vessel may be taken in these tanks, instead of being taken in hogsheads, in which case it is apparent there would be a great saving of room and labor.



CHAPTER XII.

MEDICAL AND SURGICAL.

Bandages. Hospital air beds. Hospital water bed. Improved water beds. Hospital sheets. Dissecting gloves. Dissecting aprons. Finger ends, or cots. Crutches. Russian belts. Abdominal supporters. Trusses. Ear trumpets. Varicose stockings. Nipple shields. Breast pump. Nursing bottles. Poulticing socks. Urine bags. Gonorrhea bags. Bed pans. Pesary. Syringes. Bellows syringes. Self-acting syringes. Invalids' cushion. Ventilated water-beds. Stethoscopes. Hot-water bottles.

It has been remarked that the medical faculty were among the first who gave attention to experiments for the purpose of improving gum-elastic, and next to the erasing of pencil marks, it was used for medical and surgical purposes. For some of these purposes, articles rudely manufactured of native gum by the Para Indians, have been highly valued, though they are now mostly superseded by an increased variety of others in this line, made of vulcanized gum-elastic. Some articles spoken of in this chapter, which are of the highest value, are hardly known to the mass of mankind, even in highly civilized life, for various reasons.

The expensiveness and only occasional use of such apparatus, has been a hinderance to their general introduction. Among this apparatus, the merit of which is not commonly known, are the hot-water bottles, water beds, and hospital sheets. The water beds cannot be too highly recommended for invalids, as they will oftentimes afford rest when no other bed will do it. The bed-spreads and hospital sheets are equally useful in their place, and probably no means are so convenient and effectual for fomentation as the hot-water bottles. The extensive manufacture and general use of this class of articles, would reduce them to a comparatively nominal expense.

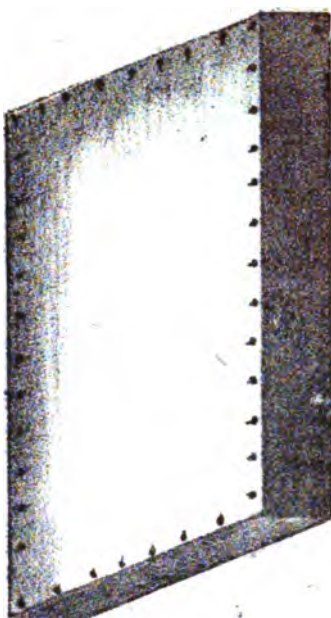
BANDAGES.

Stayed compound drapery, medicated drapery, and perforated felt, and fibrous fabrics, which may be found in the piece at the shops, are highly approved for bandages in many cases. Perforated gum-elastic knit goods may also be used for the same purpose. Perforated knit goods are sometimes preferred for bandages, because they may be stitched to fit the limbs, and possess greater strength than drapery. A piece of any size to fit the limb, being cut from the elastic knit goods, perforated fibrous fabric, or felt, will commonly be found the cheapest and best bandage for lame, rheumatic, or sprained limbs, or to wear around the body. The great objection to India rubber bandages has heretofore been excessive warmth. This is obviated in the perforated goods.

When the design is to sweat or foment the limb, or when these bandages are to be used in the army, navy, or elsewhere, for the stoppage of hemorrhage, medicated drapery, *not perforated*, will be found cheapest and best. These bandages are highly approved for the above purposes, and may be recommended as a truly useful article; but in chronic affections, or gout, as has been remarked, in the description of medicated drapery, these fabrics produce no good effect.

HOSPITAL AIR BEDS.

This name is applied to these beds, because they are particularly adapted for the comfort of invalids; at the same time the opinion is entertained that they are better calculated for common use, and particularly for ships' use, than any other kind of air bed. They are made of gum-elastic, vellum, or knit goods, in separate cylinders, or what might equally well be termed life-preservers, because, when trimmed for the pur-



pose, they are really such, and answer quite as well as those which are sold expressly for that purpose only. The cylinders, being placed parallel to each other, are buttoned to a strap, as represented in plate vii., fig. 1, or they may be covered with a case, or tick, of the common sort, or of coated cloth, or vellum. These beds have one very great superiority over those in which the compartments are connected, as they can be easily repaired. When one cylinder is damaged by a small leak it can be detected by immersing it in water, when it might be impossible to discover it in a whole bed where all the compartments are connected, and in this case the injury only extends to a fifteenth or twentieth part, according to the number of cylinders. Besides, a damaged cylinder may be replaced by another, or dispensed with altogether, until it can be mended.

Another recommendation of this article is, that one or more of the cylinders may be collapsed, or taken out from under an invalid, so as to relieve any part of the body from pressure, or to give a circulation of air.

HOSPITAL WATER BED.

This bed is made as represented in plate vii., fig. 2, by filling a box with water, and spreading over it a cloth coated with gum, which is nailed to the edge of the box.

These beds are more troublesome to fill than air beds, and, when filled, they are very heavy; but they are without any other objection, and are much easier and more comfortable, especially for the sick and lame, than any kind of air bed.

IMPROVED WATER BEDS.

These are represented by fig. 3 in plate vii. The improvement over an ordinary water bed consists in the addition of a

mouth about twelve inches wide, sufficiently large to admit a bucket of water or a quantity of ice at once, by which means hot or cold applications can be made.

The mouth is closed by the fastening represented, plate vi., fig. . The bed represented by fig. 4, is the same as fig. 3, except it is made in different compartments like an air bed, and has also a hose attached, with a copper bulb at the end, by which the water in the bed may be heated, by placing the bulb in a furnace, or grate, at a distance from the bed, in order to impart warmth to the patient.

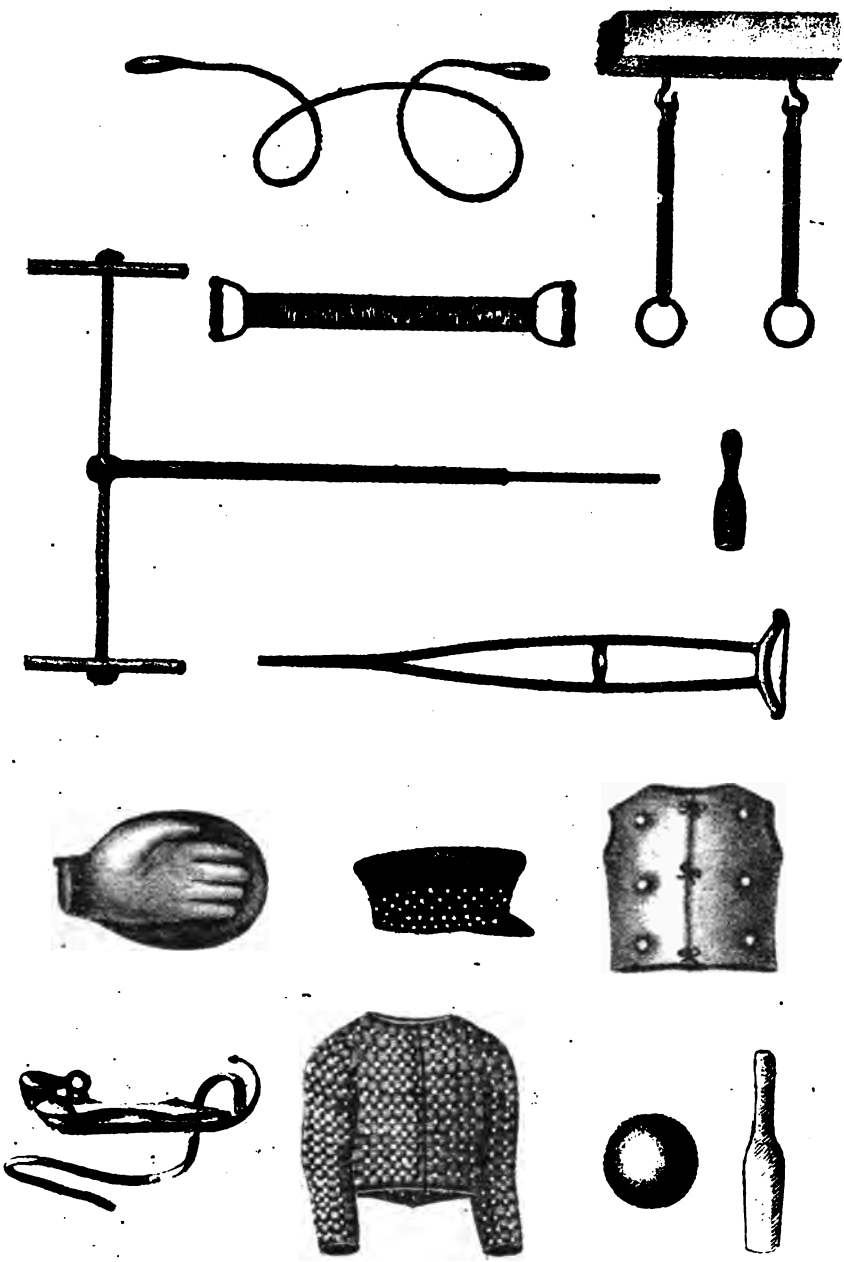
HOSPITAL SHEETS.

These are made of plated cloths, or vellum, about 5 feet by 6 feet in dimensions. In hospitals and sick rooms they are an almost indispensable article for the protection of beds, mattresses, &c., tending very much to the comfort of the patients, as well as their attendants.

DISSECTING GLOVES.

The sleeves and hands of dissecting gloves are made of perforated vellum, except the finger ends, which are made of drapery which is not perforated, in order that the fingers may be more completely protected, the other parts being made pervious, that they may not be uncomfortably warm for the wearer.

When attached to the dissecting apron hereafter described, or worn with it, they will be found to be useful articles, and, it may be hoped, prevent the fatal accidents that so frequently occur in the profession. The drapery, although difficult to be cut with an edged tool, is yet so delicate as scarcely to interfere with the sense of touch.



DISSECTING APRONS.

This article may be best made of gum-elastic vellum, in the form of a frock, with sleeves attached. When worn with the gloves before described, the hands will not only be protected, but the person will also be protected from the offensive effluvia of the dissecting room.

FINGER ENDS, OR COTS.

Cots are made of gum-elastic drapery and perforated drapery. They are used by fishermen and mechanics, and they are also very useful for the cure of cut and wounded fingers. When protected by them, the hands may be washed in hot or cold water with impunity.

CRUTCHES.

This article is made in two parts, in order that it may be taken to pieces and packed for travelling. The head is covered with a cushion of elastic sponge, and a spring or cushion of the same material is inserted, either in the socket between the parts, or at the end. These two cushions have the effect to make them quite easy for walking.

The wood may be covered with gum-elastic vellum, put on with glue. This covering prevents the unpleasant rattling noise commonly attending the use of crutches.

An improved and beautiful article of this kind is also made of caoutchouc whalebone, of various patterns. See plate , fig.

RUSSIAN BELTS.

These are a well-known article, made as heretofore, of various materials, with the substitution of perforated stayed compound, or knit goods for the springs, instead of the native gum webbing formerly used. See plate xviii., fig. 2.

ABDOMINAL SUPPORTERS.

These are made of different patterns, but the one which is represented plate xviii., fig. 1, has been the most generally approved, so far as the writer is informed. It is the invention of a professional gentleman.* Wherever it has been used it is spoken of in the highest terms. The only objection to it, heretofore, was a tendency to sweat the person, but since the application of perforated stayed compound, and other perforated gum-elastic goods to this use, this objection is entirely removed. There is now no question, but this and other gum-elastic supporters of a similar kind, will prove a lasting benefit to many persons. A plain piece of perforated knit goods or stayed compound, such as is sold at the shops, may also be made to answer this purpose very well.

TRUSSES.

The springs of some kinds of trusses are advantageously made either of the perforated stayed compound, or shirred goods. It is also proposed to use vellum, or plated muslin, for covering the steel or metal part of the truss, instead of morocco, buckskin, and silk, which have heretofore been used; and, at the same time, to cover the parts which require to be made soft, with elastic sponge.

* Dr. Frank Meers, of Naugatuck.

EAR TRUMPETS.

These are articles which, for many years, have been made of spiral wire hose, covered with native gum and velvet, with ivory or horn trimmings. A superior article is now made of vulcanized gum-elastic hose, trimmed with caoutchouc ivory and whalebone.

VARICOSE STOCKINGS.

This article, which has heretofore been made in Europe of the covered native gum thread, is made at much less expense, either of perforated elastic compound, or perforated knit goods.

The article is designed to be used for the bandaging of varicose veins.

NIPPLE SHIELDS.

The shield of this article is made of caoutchouc ivory or whalebone compound. The nipple of elastic compound. They are designed as a substitute for an article of this kind heretofore made of wood and metal. See plate vii. fig. 5.

BREAST PUMP.

This article is made of a hollow bulb of elastic compound, about one-quarter of an inch in thickness, and about four inches in diameter, with a glass tube inserted at the mouth of the bulb. The pump being applied to the breast, acts by the expansion of the bulb after the air has been expelled. This may be con-

sidered the simplest and most useful instrument of the kind, and one which has been generally introduced in the United States. See plate vii., fig. 6.

NURSING BOTTLES.

Nursing bottles of glass may be fitted with caoutchouc whale-bone tube and elastic cork, to be cheap and useful.

POULTICING SOCKS.

These are a cheap article made of gum-elastic vellum, manufactured after the manner of water-bottles, described page . They are used for keeping poultices moist, when drawn over them on the feet or hands.

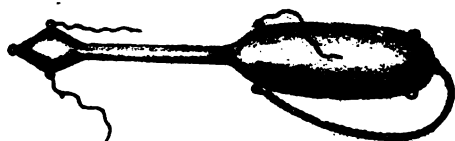
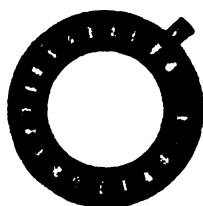
URINE BAGS.

Are made of gum-elastic compound and plated fabrics. They are made of different patterns, as represented, plate vii., by the different figures 9, 10, and 11.

The insoluble properties of these fabrics, together with their pliability, render them very suitable for this purpose.

GONORRHEA BAGS.

These are made of plated fabrics, or elastic compound, and are well adapted to the purpose for which they are made. See plate vii., fig. 12.



BED PANS.

These are intended as a substitute for the earthen or metal pans commonly used. They are made of whalebone and elastic fabrics, with a rim to be inflated with air. See plate vii., fig. 13.

PESSARY.

This article is made of a ring of non-elastic compound, or whalebone, in the same manner as hollow-ware.

SYRINGES.

Syringes are among the number of articles that were found to answer a good purpose, as made by the natives of Brazil.

Those made of vulcanized gum-elastic, after the manner of hollow ware, as represented, plate vii., figs. 14, 15, 16 and 17, are generally introduced in the United States. Like the syringes formerly manufactured by the natives, they have the recommendation of being filled by suction, from the elasticity of the gum.

BELLOWS SYRINGES.

This is a pattern of syringe, represented, plate vii., fig. 18. It is the invention of a professional gentleman of New York,* and may be considered a decided improvement, on account of the facility with which they can be operated by the patients themselves.

* Dr. Joseph Bradshaw.

SELF-ACTING SYRINGES.

Fig. 18, plate vii., represents the pattern of syringe which has for many years been made in Europe, of the MacIntosh cloths. This syringe is designed to act by the pressure of the fluid. The vulcanized fabrics are found to answer best for these as well as all other syringes, particularly on account of their resistance of the action of oils.

INVALIDS' CUSHIONS.

The different kinds of cushions described in Chapter XXVII., on Air-work, have been particularly noticed, as most comfortable for invalids when travelling; but the articles here alluded to, are cushions of various shapes, made to suit the cases of different patients.

They are mostly of the smaller sizes, and designed to relieve the patient in cases of severe illness. See plate xxvii., figs. 4, 5, and 6.

VENTILATED WATER BEDS.

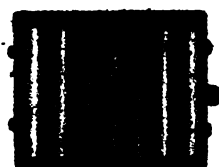
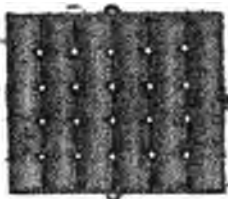
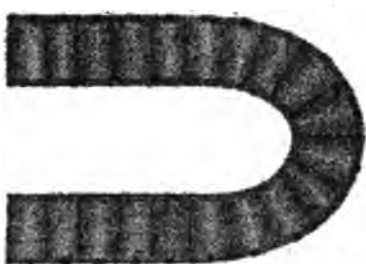
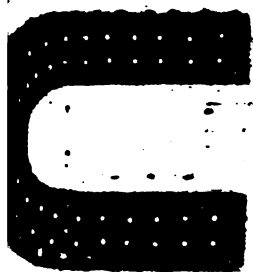
These are made of strong barred vegetable leather, of the pattern, in all respects, like the ventilated air bed, represented, plate , fig. , except that the opening for filling them is made large, like those of the other water beds, represented, plate , fig. .

STETHESCOPIES.

These are made of artificial ivory.

HOT-WATER BOTTLES.

See Chapter , and plate xxx.



CHAPTER XIII.

PHILOSOPHICAL, OPTICAL, AND MATHEMATICAL INSTRUMENTS.

Thermometer frames and scales. Telescopes. Gas bags. Gasometers. Hydrostatic bellows. Opera glass cases. Quadrants. Barometers and chronometers. Water levels. Squares and bevels, curves, triangles, and parallel rules. Reel measures. Levelling rods. Dry measures. Wine measures. Scales and rules. Instrument cases. Instrument handles.

THERE are a variety of instruments and appliances under this head, for which the caoutchouc fabrics and compounds are found useful ; among them the following may be noticed.

THERMOMETER FRAMES AND SCALES.

Thermometer frames are manufactured of caoutchouc whale-bone. This material is suitable for this purpose, because it is not warped or cracked by heat or cold like wood, or corroded like metal. They may be immersed in boiling liquids or steam without being injured.

TELESCOPES.

The cases of telescopes, opera spy-glasses, and other optical instruments, may be made with advantage of caoutchouc whale-bone or ivory, or being made of sheet metal, they may be improved by being enameled with caoutchouc enamel.

GAS BAGS.

These are among the articles first made of the McIntosh fabrics, and which were commonly found to answer a good purpose. They are now more cheaply manufactured, and answer better when made of vulcanized gum-elastic plated fabrics or elastic compound.

They are made small for the laboratory, or of extra large sizes for the conveyance of gas from one place to another.

The value of the fabrics for this purpose is becoming well known to chemists and others.

GASOMETERS.

A tank or reservoir is made of caoutchouc plated canvas for holding gas in boats and buildings, where it is made on the premises. They are made of the same form as a tub or bellows, with a top of whalebone board, upon which weights may be placed when required, or they are constructed like self-inflating air-work. See plate , figs.

HYDROSTATIC BELLOWS.

The sides of these bellows are made of plated India rubber canvas, in the common form, as represented plate , fig. , or that of self-inflating air-work, which is preferable, as in fig. . The tops and bottoms are made of caoutchouc whalebone board, to which the flexible parts or bellows of the instrument are cemented; consequently, nails are dispensed with in the manufacture, while the seams are quite tight and strong, and altogether the article is very superior to those which were formerly made of other materials.

OPERA GLASS CASES.

Caoutchouc ivory is a suitable material for the cases of opera glasses, because of its lightness, and not being affected by change of temperature. See plate , figs.

QUADRANTS.

Those parts of the frames of quadrants which have heretofore been made of wood, may be made stronger and less liable to warp and crack, from caoutchouc ivory and whalebone. See plate , figs.

BAROMETERS AND CHRONOMETERS.

The cases of barometers and chronometers may be advantageously moulded from caoutchouc whalebone. The cases of clocks and time-pieces are also made of the same materials, in the same way ; or when made of wood, they are veneered with caoutchouc veneer. An improvement is also made in these cases by packing them with gum-elastic sponge, so as to make them quite water and air-tight, thereby excluding dust and dampness. See plate , fig.

WATER LEVELS.

Caoutchouc ivory and whalebone are materials suitable for water or spirit levels, on account of their solidity, and not being liable to warp or crack.

SQUARES AND BEVELS, CURVES, TRIANGLES, AND PARALLEL RULES.

Caoutchouc whalebone is equally well adapted for these articles, as all of them require tough, hard, and durable materials. As they are all of them made in the same way in moulds, or between plates of metal, they are described under one head.

REEL MEASURES.

The cases of carpenter's reel measures are made of caoutchouc whalebone. The measure, or tape, is made of gum-elastic vellum, or of linen tape coated with gum-elastic compound. The whole making an improved tape measure. See plate , figs.

LEVELING RODS

The large dimensions, and the use which is made of leveling rods, require that they should be made of a material less liable to spring or warp than any wood of which they have heretofore been made. When moulded of caoutchouc, they may be made hollow and light without being liable to either of these objections. Like scales and rules, they are graduated in moulds when vulcanized.

DRY MEASURES.

Dry measures are made of caoutchouc whalebone and whalebone board. When formed of these materials, they are strong, light, and durable. See plate , figs.

WINE MEASURES.

These articles are manufactured of caoutchouc whalebone. They are moulded of this material in one entire piece.

They are much lighter than metal; they are preferable to tin or copper, because they do not rust or corrode, and owing to their elasticity, they are not, like tin or metal, liable to be indented. See plate , figs.

SCALES AND RULES.

Mathematical scales and carpenter's rules are manufactured of caoutchouc whalebone and ivory, as substitutes for boxwood and ivory. Although they are not yet made as white as ivory, they are preferable to either boxwood or ivory on other accounts. They are stronger and not so liable to warp or crack as ivory or boxwood. They are manufactured with much greater economy in the saving of labor and material. The mountings are securely set in while they are being vulcanized in the mould. They are also graduated by the mould during the same process. By which process the cost of manufacture is very trifling compared with that of other rules, as heretofore.

INSTRUMENT CASES.

These are made of caoutchouc whalebone. The two parts moulded, each of them, in one entire piece.

They are further improved by a hinge of gum-elastic compound, and a cushion or packing of gum-elastic fabric around the edge, which makes them quite air-tight, so that the instruments contained in them are prevented from rusting. See plate , fig.

INSTRUMENT HANDLES.

Superior handles are manufactured from caoutchouc ivory and whalebone, for various kinds of surgical, dental, etching, drawing, and engraving instruments. The shanks of the instruments being made rough, the handles are formed on them, and shaped in moulds when vulcanized, whereby there is great economy in the manufacture; and a decided improvement is made in the tools by the handles being secured so perfectly that they cannot come off, or be taken off without destroying them. See plate , figs.

CHAPTER XIV.

MUSICAL.

Fife. Flute. Clarinet. Clarinet reeds. Piano-forte. Instrument key stops. Organs. Accordions. Bag-pipes. Music boxes. Bass viols and violins. Drums.

Soon after the invention of caoutchouc or gum-elastic ivory, it was supposed that it would probably answer well for some kinds of musical instruments, before any experiments had been made to ascertain how far it might be used for such purposes. Since that time it has been proved that this material may be applied to a much greater variety of them than was even supposed, and that, including the other compounds and fabrics, some one or more of them may be used either for the whole or for parts of almost every musical instrument.

The advantages claimed for these substances for this use, will be alluded to in the description of some of the articles hereafter specified, as the different substances have their peculiar advantages for particular instruments. There is great economy in the manufacture of nearly all of them. They may be moulded into perfect forms, with a perfect finish, as easily as wax or lead could be made into the same shapes, and the farther facility with which they are vulcanized by a new method, described Vol. I., page , renders it certain that this new use of caoutchouc or gum-elastic, will become one of the most extensive.

Another superiority claimed for these instruments is that, owing to their uniform quality (unlike those of wood) and to their

uniformity of shape, the cheapest kinds of them may be equal to the most costly, so far as tone is concerned, which will bring within the reach of all classes, instruments equally good. Among those which have been made are the following.

FIFE.

Gum-elastic ivory was first applied to this instrument as being the most simple in its construction. The experiment was entirely successful.

FLUTE.

For this instrument caoutchouc or gum-elastic ivory has properties peculiarly adapted. Being impervious to moisture, it is not, like ivory or wood, liable to split, and for tone it far surpasses either of those materials.

CLARINET.

The gum-elastic ivory is also adapted to clarionets, the tone of which it improves even more than that of the flute.

CLARINET REEDS.

India rubber whalebone has the qualities suitable for the reeds of clarionets and other wind instruments—toughness and elasticity.

PIANO-FORTES.

It is yet a subject of inquiry, to what extent caoutchouc may be applied to the construction of piano-fortes; but it is confidently expected that caoutchouc veneers will be substituted in their manufacture for wood veneers, on account of their cheapness and durability, their not being liable to warp, as well as their susceptibility of receiving a variety of ornamental styles of finish, more beautiful than wood. The ivory compound is suitable for the black keys.

As early as 1845 or '46 the writer applied the vulcanized gum-elastic to piano-forte hammers. The experiment did not then result in any improvement. Since that time, the various fabrics having been made of every grade of texture, from the softest kid to that of ivory, and these various textures being made susceptible of combination in different layers, it is presumed that this application will eventually become quite successful.

INSTRUMENT KEY STOPS.

The water-proof quality and softness of the gum-elastic sponge fabric, and also of the elastic compounds, render these fabrics well adapted for key stops for musical instruments.

They are most completely made in moulds, with the inside of sponge and the outside of elastic compound, the back being napped with fibre for cementing to the key.

ORGANS.

The extent of the application of caoutchouc to the construction of organs, is, as in the case of some other instruments, in some degree a matter of conjecture. There is, however, little doubt but that the pipes may be advantageously made of caoutchouc whalebone or ivory. The bellows also may be made of plated canvas, which will no doubt answer this purpose better than leather.

ACCORDIONS.

India rubber whalebone and ivory are unquestionably superior substances for those parts of accordions which have heretofore been made of wood, because of the facility with which they are moulded, and their being not liable to warp. The light gum-elastic fabrics, tissue and vellum, are also suitable for the bellows on account of their pliability, durability, and air-proof qualities.

BAG-PIPES.

The pipes of the bag-pipe may be made of caoutchouc ivory, the bags of plated fabrics or vegetable leather.

MUSIC BOXES.

Caoutchouc ivory is well adapted to the manufacture of the cases of music boxes, because of its elasticity, its durable properties, and the facility with which it is moulded and ornamented.

BASS VIOLS AND VIOLINS.

Some experiments have been made with these instruments, from which ultimate success in the manufacture of them from caoutchouc may be reasonably anticipated.

DRUMS.

India rubber whalebone board and whalebone are suitable materials for drums. The flexible fabrics, plated canvas, or vellum, are suitable for drum heads, because they are not injured by dampness. The elastic knit fabrics are also well adapted for the heads and covering the sticks of the bass drum.

CHAPTER XV.

GYMNASTICS AND CALISTHENICS.

Gymnastic ropes. Jump ropes. Inflated bat-club. Chest expanders. Baby jumpers. Swings.
Invalids' jumper.

GYMNASTIC ROPES

Are manufactured from elastic cordage. There is no advantage claimed for these over common ropes, unless it is their elasticity and giving variety to articles constructed of them. See plate xv., fig. 1.

JUMP ROPES

Are manufactured from elastic cordage. It is no better for this purpose than common rope, except that it may serve to please better as a toy, and afford additional gymnastic exercise and amusement, on account of its elasticity.

INFLATED BAT-CLUB.

This article is made of vellum or felt, and is inflated by a self-acting valve tube at the end. They form a weapon, the hardest blows from which are quite harmless. See plate xv., fig. 2.

CHEST EXPANDERS.

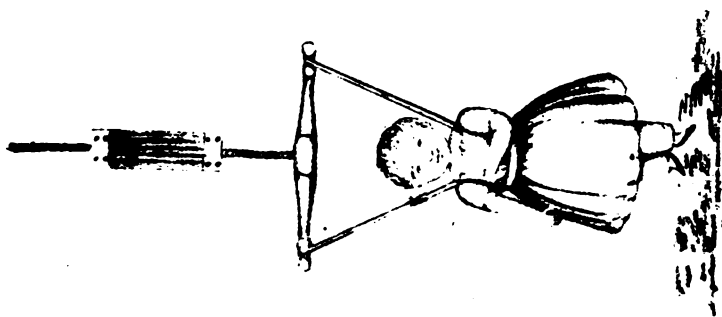
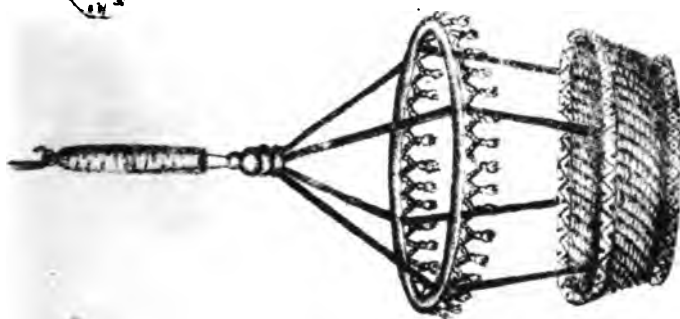
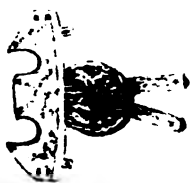
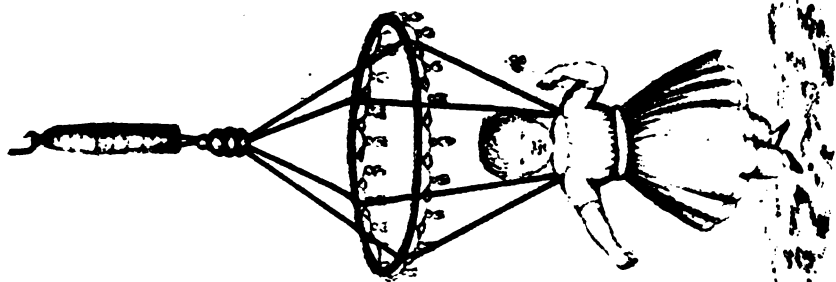
This is a strap of shirred goods, or elastic compound, used for exercising the arms and chest, with a handle attached to each end. See plate xv., fig. 3.

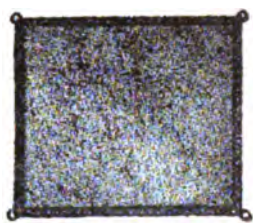
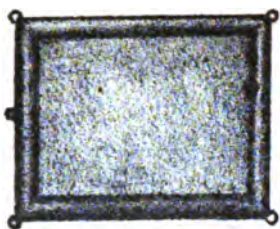
BABY JUMPERS,

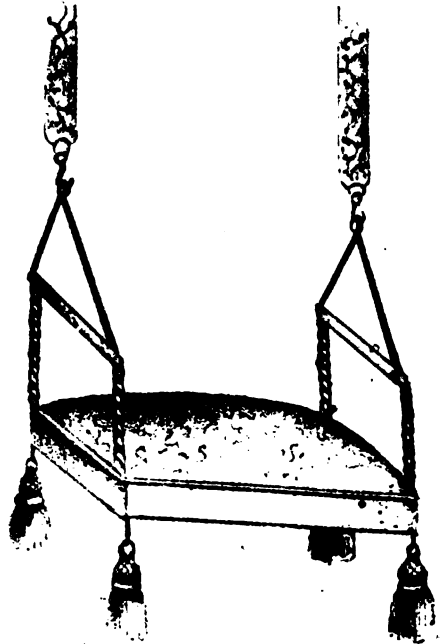
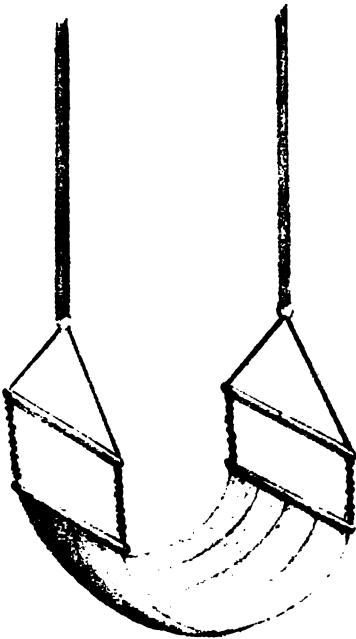
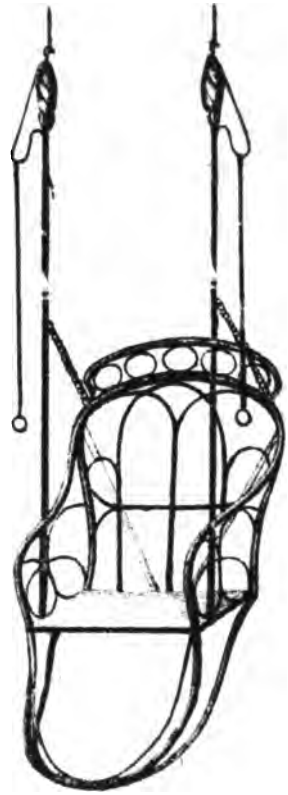
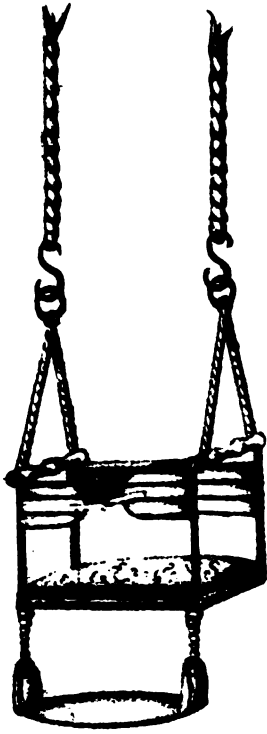
Or what are sometimes called the infant's gymnasium, will be understood by the diagrams in the plate, so that they may be constructed in a cheap way by those who cannot afford to purchase a completely manufactured article.

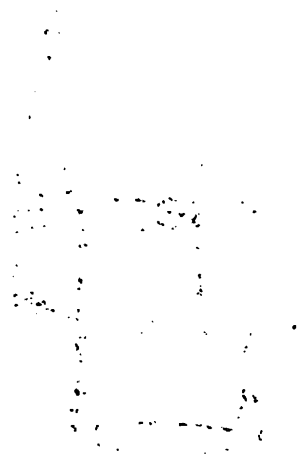
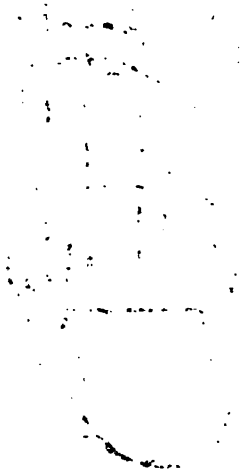
Fig. 4 is the cheapest and really most convenient arrangement, consisting of a straight bar of wood or bamboo, or a tin tube, which should be cushioned and covered; this is a substitute for the hoops that are used in fig. 2. The springs of elastic cordage or stayed compound used for this purpose, are about eighteen inches long, one inch wide, and one-quarter of an inch in thickness. Figs. 5 and 6 represents two kinds of harness or dress, into which the child is placed, before it is suspended by the straps to the hoops or bars.

In fig. 4 the straps are united, and hung over the bars at the ends, by which the child is so balanced that there is not the slightest danger of its getting loose; a small notch or bead being formed at the ends of the bar to prevent the strap slipping off. In figs. 7 and 8, the straps are buttoned to hoops. A basket of light willow, fig. 9, is commonly first used for the infant, which answers a much better purpose than the rocking cradle, giving the tossing motion with which children are so well pleased. At the age of about five months, the infant is old enough to be put into the jumper, with which they almost uniformly continue to be delighted from the first time they are placed in it, until they can walk, when they prefer a wider range. Should they, as sometimes happens, acquire a habit of whirling around, a string









attached to a bed-post, a nail, or some part of the room, will prevent them.

The spring was first applied to this purpose by the factory operatives at Naugatuck, when the apparatus was made in a rude way, after the plan of fig. 4. The springs were next put in market for sale. The fanciful arrangement of the hoop was invented and patented by a gentleman in New York.*

The springs may be obtained at the shops, at a low price, and trimmed by any person according to their own taste and means.

Care should be taken when the child is suspended from a hook in the wall, that it is strongly fastened, as the consequences of neglect to do this have sometimes proved serious.

SWINGS.

The seats of these swings are covered with gum-elastic vellum, vegetable leather, or cushioned with gum-elastic sponge fabric, so as not to be injured by exposure to the weather.

A spring of elastic cordage is inserted in the strap or rope, in the manner represented in the plate, figs. 10 and 11, which gives a perpendicular, as well as a backward and forward motion to the swing.

INVALIDS' JUMPER.

This is made on much the same plan as the springs above described, except that a chair is used instead of a seat, as represented in the plate, figs. 12 and 13, with hand straps attached.

* Mr. George Tuttle

CHAPTER XVI.

TOYS AND TRIFLES.

Dolls. Magnetic toys. Quadrupeds and birds. Air hoops. Rattle-boxes. Cross-bows. Toy guns. Teething rings. Battle-door. Picture books. Kites. Whistles. Needle cases. Watch guards. Shawl pins. Hair clasps. Bat and parlor balls. Hair loop. Churches and cottages. Vehicles. Boats. Hard compound toys.

A VARIETY of toys are made already of the different gum-elastic fabrics, and it is very evident that the list of them may be ended almost indefinitely. A few of them only are described this work.

The tissue is well adapted for kites; the hollow ware for rattle-boxes, dolls, balls, &c., as well as for the magnetic toys, such as fishes, ducks, quadrupeds, &c.; the drapery for some ornamental articles, imitation grapes, &c. Of the importance of these improvements in the extension of the manufacture of toys, the writer has nothing to say, but much might be said as relates to economy in such as are made. It will be admitted most certainly, that vast sums of money may be saved in the aggregate, by the manufacture of toys from materials that will cause them to last for years instead of a passing hour. It may be remarked that gum-elastic toys, as regards form, finish, &c., are, in general, or may be much more true to nature, uniform, and complete than other toys commonly are; and that where oil colors are put upon the surface of the toys, when they become defaced or soiled, as they generally will be before the article receives the slightest injury in any other way, the coloring may all be removed by boiling in soap suds, and the toy be left white, or recolored if desired.

If the good maxim is applicable to toys, as to other

things, that every thing which is worth doing is worth doing well; and more than all, if the durability of these things is of any sort of consequence, the value of gum-elastic for these branches of manufacture is greater than would at first appear; and it is not strange that it should have been one of the first attended to by the Indians, in the construction upon clay forms of such rude images as they conceived to be quadrupeds and birds, and which were sold in civilized countries to considerable extent for toys.

It may be submitted to the investigations of the phrenologist, to ascertain what effect the durability of gum-elastic toys may have upon the organ of destructiveness in children; certain it is, however much they may exercise it, it will not be easy for them to destroy or mutilate these toys.

DOLLS.

This is, perhaps, the most important of all the articles in the toy line, at least the one which is the most in demand.

This article is made after the method of hollow ware, either of elastic compound or of gum-elastic ivory. It cannot be injured by the ordinary play of children without the aid of fire, violence, or very destructive edge tools.

On the manufacture of the first specimen, the license for this article for the United States, was disposed of by the writer to an enterprising merchant of New York.*

MAGNETIC TOYS.

Fishes, ducks, tortoises, &c. are made of elastic compound or gum-elastic ivory, after the method of hollow ware. They are magnetized in the same way as the metal toys have.

* B. F. Lee.

fore been, by the insertion of a steel point at the nose or bill. For the information of those who have not seen these toys, it may be said, that when placed in the water, they will sail or swim after a magnet when one pole of it is placed before them, or go from it when approached with the other pole of the magnet. See plate vi., fig. 1.

QUADRUPEDS AND BIRDS.

These are also made in moulds like hollow ware, and may be so constructed as to make different sounds, without being so liable as other toys to get out of repair in this particular.

AIR HOOPS.

Hoops of all sizes may be made of elastic compound, and inflated with the self-acting valve tube. See plate vi., fig. 2.

Solid hoops may also be very completely made of gum-elastic whalebone.

RATTLE BOXES

Are made of elastic compound, with the handle of the same material, and a teething ring of elastic compound attached to it. Being quite soft to the mouth, they make a suitable toy for young children. The sound of these boxes is very good, being produced by small metal bells within the box. See plate vi., fig. 3.

CROSS-BOWS.

Gum-elastic springs are used for cross-bows, as represented in plate vi., fig. 4. The advantage of this spring over the bow is, that it does not occupy much space like the bow.

TOY GUNS.

These may be made in a variety of ways, with an elastic spring like the cross-bow described. The only objection to these guns is, that they require care, to prevent their becoming a deadly weapon.

TEETHING RINGS.

This is one of the first toys made of the native gum-elastic in France and England, many years previous to their being made in America, of vulcanized gum-elastic.

BATTLE-DOOR.

The cork for this toy is made of gum-elastic sponge and feathers, and the bat of a hoop, of gum-elastic whalebone, covered with gum-elastic vellum or parchment.

PICTURE BOOKS.

May be made of elastic tissue to advantage, if durability is at all desirable in such an article.

KITES.

The frame of all kinds of kites may be covered with tissue to much advantage, not only because it is more durable than paper, but because it is water-proof, and may be *kited* in a storm.

Kites are also made of this fabric inflated with air around the border, which are inflated by the self-acting valve tube. See plate vi., fig. 8.

WHISTLES.

These may be noticed, as being made of non-elastic compound and gum-elastic ivory, on account of their being a common toy, and forming an appendage of the child's teething ring. Whoever purchases the article at a fair profit upon the cost of production, will not have occasion to complain of having paid too "dear for the whistle." The invention of a lady.

NEEDLE CASES.

A case for securing knitting needles is very completely made of gum-elastic ivory, in connection with a spring of gum-elastic braided cord. See plate vi., fig. 5.

This article was first made in Europe, of metal, with a spring of the native gum.

WATCH GUARDS.

These are well known to the public generally, as among the convenient and useful articles formerly made of braided cord from native gum-elastic, now made of vulcanized cord.

When made of vulcanized cord, they do not soften or decompose like those made of the native gum.

SHAWL PINE.

A useful little article made with a cap, to cover the point of the pin, and attached to it by a spring of gum-elastic braided cord. See plate vi., fig. 6.

HAIR CLASP.

This is an ingenious little article,* made of gum-elastic, with a clasp of polished steel, or other metal, and used by ladies as a hair tie. There is also a tape made of gum-elastic, which is used for the same purpose, alluded to, Chapter XIV. See plate , fig. .

BAT AND PARLOR BALLS.

See Chapter

HAIR LOOP.

This consists of an elastic ring or tie, looped upon an artificial ivory button. It is found useful for fastening ladies' hair. See plate vi., fig. .

* Invented by a gentleman of Worcester, Mass.

CHURCHES AND COTTAGES.

A variety of these and other toy buildings are made of gum-elastic compound, in moulds, like other toys.

VEHICLES.

For this class of toys the gum-elastic compounds have two special recommendations. They are much more durable than wooden vehicles, and do not make a rattling noise, like those of tin.

BOATS.

These fabrics, both the elastic compound and whalebone, are exactly suited to the manufacture of toy boats, on account of their strength and water-proof quality.

HARD COMPOUND TOYS.

All the toys that have been described, and an almost endless variety of others not noticed, may be made of the hard compounds—caoutchouc enamel, ivory and whalebone—with advantage.

CHAPTER XVII.

SPORTS AND GAMES.

Footballs. Parlor balls. Bat and wicket balls. Boxing gloves. Boxing jackets. Ten-pins. Billiard cushions. Billiard balls. Improved skates. Skate trimmings. Skating caps. Skating jackets. Backgammon boards.

FOOTBALLS

ARE either made of elastic compound, in the same way as hollow-ware, or they may be more substantially made of gum-elastic felt, or vegetable leather.

These are uniformly inflated with a tube, as they are not otherwise made stiff enough to retain their shape without being too heavy.

In case these balls become damaged, they may be used instead of leather cases for bladders, although when properly manufactured, it will be found an exceedingly difficult matter to injure them fairly.

PARLOR BALLS.

Parlor balls are manufactured from tissue or vellum, and are inflated by the self-acting valve tube, described, page .

A curious article of this kind is also made from drapery, stayed by being netted with elastic cord. See plate xxiii. fig. 1.

BAT AND WICKET BALLS

Are made of elastic compound, by the method of manufacturing hollow-ware, described, page , Vol. I. When made of a suitable thickness, they will not collapse when damaged, but will retain their shape from their elasticity. They are sometimes perforated in the manufacture like sleigh bells, to admit the sound of small bells or pieces of metal that are inclosed within them when they are made.

All the varieties of gum-elastic balls admit of various styles of ornamenting, embossing, &c.

BOXING GLOVES.

The boxing gloves heretofore manufactured of buck-skin, may be improved by attaching an air chamber upon the back of the glove, instead of one that is stuffed ; or the whole glove may be made of gum-elastic fabrics, making use of the perforated fabrics for the glove. In either case the article is inflated with the self-acting valve tube. See plate xxiii., fig. 2.

BOXING JACKETS.

This article is made of ventilated air-work of gum-elastic knit fabrics. When inflated with air, the hardest blow has very little effect upon the person wearing it. See plate xxiii., fig. 3.

TEN-PINS.

These are wooden pins of the common kind, first covered with vellum cloth, and next wound with vellum cord, like cord ware. They are also made either of gum-elastic sponge or elastic

compound, in moulds, in the same manner as bat balls. They may be weighted with fluids or metals, so as to stand more or less firmly, and to be more or less liable to be scattered by the ball.

BILLIARD CUSHIONS.

The native gum has formerly been used for this purpose with some success.

A decided improvement has been made in this article by a billiard-table manufacturer in New York,* by the use of tubes made of vulcanized gum, and ropes made of gum-elastic sponge. These cushions or ropes of gum-elastic sponge are joined to the rim of the table, and are considered a great improvement upon billiard tables.

BILLIARD BALLS.

It is supposed that caoutchouc ivory may answer better for billiard balls than real ivory, for the reason that there is not the same difference in the weight of its parts that there is in real ivory, and because the material is cheaper, is worked without waste, and can be made of any desirable degree of hardness.

IMPROVED SKATES.

A description of this article is given, because it is believed it will form a valuable improvement in skates, and for the reason that it illustrates forcibly, as in the article of Military Caps, the advantages which are derived from welding the hard and non-elastic vulcanized fabrics, to the flexible and elastic ones.

* Mr. Abraham Bamford.

These skates are formed in moulds like gum-elastic hollow-ware. The steel runner is inserted in the bed, (which is made of caoutchouc ivory,) when the ivory is in a soft state.

The upper part, or shoe, is made of perforated elastic compound, and cemented to the caoutchouc ivory. When straps are required, they are also cemented to the ivory; the entire skate is then vulcanized in the mould at one time. The design of the elastic shoe and straps is to obviate the difficulty of the skate getting loose, and the feet being hurt, as is the case with skates fastened in the usual way with leather. See plate xxiii., fig. 7.

SKATE TRIMMINGS.

Skates may be more firmly bound to the feet, and rendered more comfortable, by inserting a spring of elastic compound near the buckle in the front straps, and the addition of a heel-strap made of perforated elastic fabrics. See plate xxiii., fig. 4.

SKATING CAPS

Are manufactured of porous napped fabrics, with a belt about four inches in width and two in thickness, made of the quilted fabrics, or of air-work, and inflated with air. See plate xxiii., fig. 5. Considering the numerous hurts received by boys falling upon the ice, this will not be considered an unnecessary precaution. The same article, when made of tissue, of suitable patterns, might also be found useful for children, to protect them from injury by falls.

SKATING JACKETS.

This article is manufactured of vellum, and is either quilted or inflated with air. It is not only designed for a life-preserver

where there is danger in skating, but is intended as a protection from harm by falling. It is made open in order to make it cool, being a sort of inflated net-work. With one of these jackets, and a cap such as is described above, lads may be safely equipped for skating. See plate xxiii., fig. 6.

BACKGAMMON BOARDS.

Gum-elastic vellum, printed or colored for the purpose, is a suitable article for covering backgammon and checker boards, on account of its durability and softness. A more highly finished and beautiful article may also be made of caoutchouc ivory, the figures and colors being inlaid while the gum is in a soft state, in the process of manufacture.

CHAPTER XVIII.

SPORTING.

Gun cases. Game bags. Fishing rods. Fish bags. Fish baskets. Self-filling bottles. Sportsmen's flasks. Sportsmen's canteens and fishermen's bottles. Sportsmen's portable cups. Shot-bags. Powder flasks. Pouches. Sportsmen's pantaloons. Sportsmen's boots. Sportsmen's coats.

A **VERY** considerable number of articles for the use of sportsmen have been made of vulcanized gum-elastic materials, and found to answer so well, that the demand for them is constantly increasing. Among numerous articles of this kind, those here described are thought to be particularly deserving of notice.

GUN CASES.

Gun cases are manufactured of non-elastic compound or vegetable leather, after the method of gum-elastic hollow-ware, and are designed as a substitute for those heretofore made of sole leather.

When the breech is made tight, in the same manner as the gun-covers described in this work, they will, like them, not only buoy up the gun in the water, and protect it from wet, but also answer in part the purposes of a life-preserver. See plate xxii., fig. 1.

GAME BAGS.

To prevent these bags from being uncomfortably warm for the sportsman, they are made of perforated gum-elastic plated

vellum, with water-proof pockets attached, made of the same material, not perforated, in which articles may be kept dry.

The netting of this article is made of elastic cord. See plate xxii., fig. 2.

FISHING RODS.

Fishing rods which are made hollow, and in sections to fit one within the other, so that they are portable, like the cane rods, may be very completely manufactured from caoutchouc whalebone.

FISH BAGS.

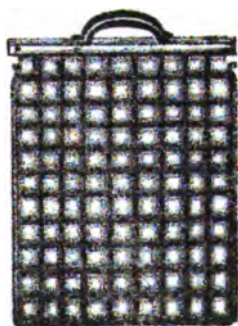
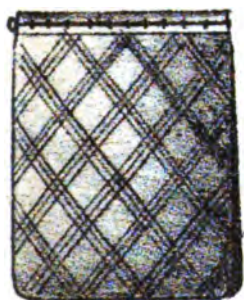
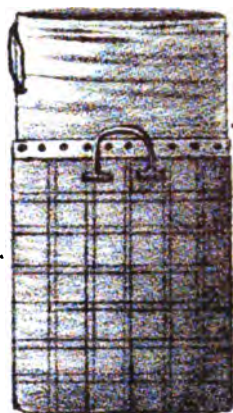
Like game bags, these are made of gum-elastic vulcanized fabrics, in two apartments, one of which is water-proof, for containing articles that need to be kept dry.

The other apartment is made of perforated goods, so that it may be taken off upon occasion, and fish may be kept alive in the water, or be carried alive in the water-proof apartment, containing water.

Separate small apartments are also added, for the purpose of containing bait, tackle, &c. See plate xxii., fig. 3.

FISH BASKETS.

This article, which has heretofore been made of willow, may be advantageously made either of cord-ware or perforated gum-elastic whalebone board. See plate xxii., fig. 4.



SELF-FILLING BOTTLES.

These are made oval-shaped, of elastic compound, of various sizes, after the manner of hollow-ware, the mouth being made of caoutchouc ivory. The improvement in these articles consists in this, that after being collapsed by the pressure of the hand, they will fill themselves without a tunnel, and will also take the water quite pure from a spring or rivulet which is very shallow, when it could not readily be obtained clear in any other way. This bottle is especially valuable to sportsmen and farmers. When it is collapsed, and the cork is inserted, it occupies but little space. See plate xxii., fig. 5.

SPORTSMEN'S FLASKS.

This is a glass bottle, covered in the same way as the bottles and demijohns described in another chapter, or they are made of caoutchouc ivory without glass. They are made in a variety of patterns, such as are commonly made of leather, in two parts; the cover or bottom which comes off, answering the purpose of a drinking cup. See plate xxii., fig. 6.

SPORTSMEN'S CANTEN AND FISHERMEN'S BOTTLE.

These articles are made with the improved caoutchouc ivory hose-stopper, (represented, plate , fig. ,) through which one can drink from them without drawing a cork, and by which they may also be inflated and used as life-preservers, when emptied of water; for these reasons, these canteens are believed to be one of the most useful and important improvements in guni-elastic. See plate xxii., fig. 7.

SPORTSMAN'S PORTABLE CUP.

These articles are made of elastic compound or vegetable leather. They are intended as a substitute for the articles heretofore made of animal leather, well known to sportsmen. The chief recommendation of this pattern of cup is, that it folds more compactly than any other.

SHOT BAGS.

Shot bags are manufactured, either single or double, of non-elastic compound or vegetable leather. They may be advantageously made in moulds, like gum-elastic hollow-ware, with caoutchouc ivory tubes, cemented to the bag in the process of manufacture.

POWDER FLASKS.

Sportsmen's flasks, for either powder or shot, are made of non-elastic compound or gum-elastic whalebone, by the same method as gum-elastic hollow-ware. They may be recommended for their durability as well as for their water-proof qualities. See plate xxii., figs. 8 and 9.

POUCHES.

A variety of patterns of these are made of gum-elastic fabrics. With the addition of the water-proof clasps or fastenings, they are made quite water-proof. See plate xxii., fig. 10.

SPORTSMEN'S PANTALOONS

Are made like sporting boots, with the addition of waistbands of plated cloth or corded vellum. They are only suitable for wading, fishing, or standing in the water, on account of their too great warmth.

SPORTSMEN'S BOOTS.

See Chapter XX.

SPORTSMEN'S BOATS.

See Chapter

CHAPTER XIX.

HORSE TRAPPINGS.

Saddles. Saddle covers. Martingal. Girths. Surcingles. Stall carpets. Riding bridles. Halters. Fly-nets. Fetters. Foot-caulking. Horse-blankets. Improved horse-blankets. Improved stirrup. Whips. Buffalo and imitation buffalo robes. Feed-bags. Hoof-shoes. Knee-fenders. Fetlock fenders.

THE ills to which the horse is subject from his very nature, in addition to his servitude, are every way deserving of consideration; and any thing that can be done for his relief, or to render his condition more comfortable, seems almost as much to be desired as if done for man himself; his sufferings demand sympathy, and man's feelings should be enlisted in his behalf, not only on the score of mercy, but also of interest. Most of the appliances of gum-elastic that are intended for the comfort of the horse, appear to be without objection. In no part of his harness is there such defect as in the collar and saddle. This defect arises mostly from the unsuitableness of the material of which they are made; and as yet, so far as has been known, no other would answer the purpose at all. It would seem that the sufferings of horses from galling collars and saddles, had ceased to be regarded, from despair of finding a remedy. The galling of the horse by the leather collar is the most obvious, but not the most injurious of its effects. It is very frequently put on cold and wet, and often frozen, and unquestionably more colds are taken by horses from this unnoticed cause than almost any other. Whether these evils are to be remedied by the inventions described in this and the following chapter, remains to be proved.

SADDLES.

Specimens of saddles have heretofore been made of gum-elastic in different ways, some inflated with air, others with elastic compound springs.

Notwithstanding there are conflicting opinions about the usefulness of springs of any kind as applied to saddles, it is believed that the manufacture of gum-elastic saddles, with springs of the same material, and also of air, will become an important one. The objection to leather saddles, that they are liable to become saturated with water, is one that is well known to all that are accustomed to horseback riding.

By exposure to the weather and storms, the saddle is not only soon destroyed, but the health and the life of the rider are much endangered. To remedy these evils is an object worthy the attention of the philanthropist, as well as the manufacturer. It is probable that vulcanized gum-elastic is suitable for this purpose, and since the introduction into this manufacture of gum-elastic sponge, and the porous fabrics and hard compounds, it is reasonable to suppose that these materials may be so combined as to form a saddle comfortable for the horse and the rider. The inventor has made some specimens, both of the common forms and those that are inflated with air, according to his idea of the best combination of these materials for this purpose. See plate xxiv., figs. 1 and 2.

SADDLE COVERS.

Saddle covers are made of gum-elastic plated fabrics. They are designed for the protection of leather saddles and the comfort of the horseman. They may also be made in moulds of gum-elastic sponge. See plate xxiv. fig. 3.

MARTINGAL.

The rings of the gum-elastic martingal are manufactured of caoutchouc ivory. The straps are corded harness leather. An improvement is made in the straps by inserting in them a spring of elastic compound. See plate xxiv., fig. 4.

GIRTHS.

Saddle girths are made of gum-elastic or other webbing, with a spring of perforated elastic compound, about two inches in length, inserted either about the middle or at either end of the girth. The springs are varied in length, according to the thickness of the compound, and the width of the web. By the use of this girth the saddle is made more secure from turning, as the girth may be drawn very tight without inconvenience to the horse.

It is believed that a perforated gum-elastic felt or vegetable leather webbing will be found to make an additional improvement in the girths here described, on account of its durability and cleanliness. When this webbing is used, it is necessary that they should be made up at the factories, for the purpose of staying the buckle holes, in the same manner as the traces and baggage straps hereafter described. See plate xxiv., fig. 5.

SURCINGLES

Are made either of woven web or of perforated felt, like the saddle-girths already described, with a spring of the same sort, only about twice the length of that in the saddle-girths, so as to

give greater elasticity. In addition to cleanliness, another advantage in the use of this surcingle is, that with it the horse's blanket can be kept on at night, which it is extremely difficult to do with a non-elastic surcingle. See plate xxiv., fig. 6.

STALL CARPETS

Are made of perforated sponge or thick packing.* Gentlemen who are careful of their horses will hardly regard the expense of this article. The entire cleanliness of a stall carpeted in this way is a great consideration, particularly if it be true, as has been stated, that blindness of horses is often in consequence of the vapor of ammonia arising from wet stalls. The comfort and health of horses may be greatly promoted by the use of these carpets. When made of a suitable thickness, this article forms not only a carpet, but also a bed for the horse. See plate xxiv., fig. 7.

RIDING BRIDLES.

The bits and buckles of these riding bridles are covered with caoutchouc enamel, the check rein is made in part of elastic compound.

The hand reins are made of corded caoutchouc leather, covered with a light woven fabric.

HALTERS.

Halters of different kinds may be cheaply and substantially made at the gum-elastic factories, of corded caoutchouc harness leather.

FLY NETS

Are made of elastic cord, spun or cut from the elastic compound. The webbings or stays which connect the netting, are made of knit goods or gum-elastic felt. The advantages claimed for this article are, that they will not soil or rot like those made of cotton or worsted, and that when soiled they can be readily cleansed by rinsing in water.

FETTERS.

The fetlock rings of these are made in moulds, of gum-elastic sponge. They are either made whole and slipped over the horse's hoof, or they are made open and secured around with buckle and straps. Instead of a chain, elastic cordage is used for connecting them. If any recommendation can be given in favor of fetters of any kind, these may be considered comparatively comfortable for animals. See plate xxiv., figs. 8 and 9.

FOOT CAULKING.

A heavy sheet of elastic compound or packing is sometimes used with very great advantage, when the frog and lower part of the horse's hoof has been wounded or injured.

It is nailed between the shoe and the bottom of the foot, so as to protect the frog from injury in travelling when it is inflamed.

HORSE-BLANKETS.

One of the earliest applications of gum-elastic was to horse-blankets, which have become well known to the public. They

are most useful when horses are standing exposed in cold storms. At other times they are objectionable on account of confining perspiration. Cloths plated on both sides are most suitable for this purpose, for the reason that cloths, coated on both sides, are not so liable to become mildewed, and to rot, as those which are coated only upon one side.

IMPROVED HORSE-BLANKETS.

An improved article of horse-blankets may be made of plated and napped fabrics, in two ways. Either by ventilating them in the way described and represented in plate - , fig. , or by making the top of the blanket of the above materials finely perforated, as represented by plate , fig. . Either of these blankets will permit the free escape of perspiration from the horse, and yet exclude the rain.

IMPROVED STIRRUP.

Stirrup irons of all sorts may be protected from rust by covering them with caoutchouc enamel. A further improvement is made in them which is particularly applicable to ladies' stirrups, by the addition of a cushion of gum-elastic sponge to the bottom of the stirrup. See plate , fig. . A limited spring of stayed elastic fabric, of about two inches in length, is inserted in the stirrup leather, which gives a pleasant elasticity to the strap. See plate xxiv., fig. 12.

WHIPS.

Team whips, or an article made as a substitute for the covered leather whips, have been manufactured by the licensees* from

* Newark India Rubber Company.

these materials, which have been much approved on account of their durability, and not being liable to be damaged by wet like leather. There is good reason to suppose that when the manufacture is farther advanced, a great variety of fancy whips, as well as whip-lashes, will be made with equal advantage and economy. The artificial gum-elastic ivory is certainly a very suitable article for the mountings of such articles.

BUFFALO, AND IMITATION BUFFALO-ROBES.

Buffalo robes are much improved and protected from wet by being covered on the flesh side of the skin with a lining of napped fabric. A good substitute for the buffalo-robe is also made by lining a heavy woolen drugget with napped caoutchouc cloth, or plating the drugget with gum-elastic.

FEED-BAGS,

Which are used by teamsters for feeding horses, are manufactured of plated fabrics, or perforated vegetable leather. When made of the former material, they may also be used for watering the horse; and when made of the perforated fabric, they may be recommended in preference to those made of close-woven canvas, on account of the free admission of air to the horse while feeding.

HOOF-SHOES.

These are made of vegetable leather, or of non-elastic compound, in moulds, after the method of gum-elastic hollow-ware. They are a useful and convenient article for protecting the feet

of lame horses while standing in the stall ; and are preferable to leather on account of their water-proof quality, especially when poultices are applied. See plate xxv., fig. 1.

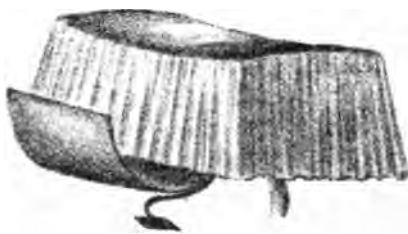
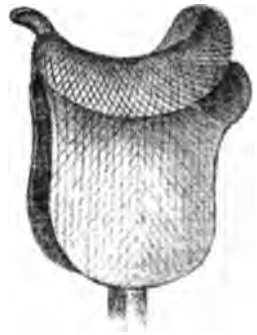
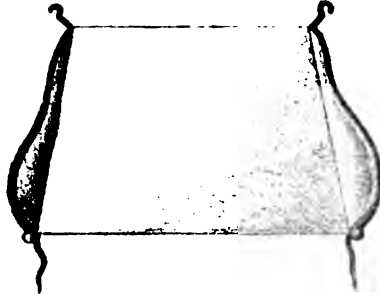
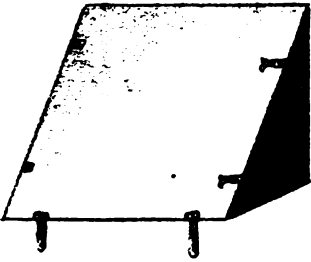
KNEE FENDERS.

Horses' knee fenders or bandages are made very complete of perforated gum-elastic felt, or stayed elastic compound. Bandages of these materials, both with and without perforating, are useful for fomentations in case of hurts, and to relieve sprains. See plate xxv., figs. 2 and 3.

FETLOCK FENDERS.

These are made of perforated caoutchouc fabrics, elastic compound, or elastic sponge, as represented plate xxv., fig. 4. They are also made in moulds, of a ring of elastic sponge, as represented, fig. 5. This ring, being sufficiently elastic for the purpose, does not require a buckle and strap, but is drawn on over the hoof.

Either of these articles will be found a desirable substitute for those made of leather, which have formerly been in use.



CHAPTER XX.

HARNESS.

Horse collars. Harness saddles. Harness bridles. Covered buckles. Baggage straps. Elastic straps. Collar pads. Traces. Reins.

THE writer first attempted to manufacture gum-elastic harness from coated canvas, in 1843, for which, together with buckles and other gum-elastic articles, a gold medal was awarded at the fair of the American Institute, in 1844. Subsequently, much difficulty was met with in the attempts to manufacture harness, in consequence of the want of a canvas strong enough for the purpose, and the buckle holes tearing out. These obstacles being now removed by the inventions hereafter described in this work, it is rendered certain that some parts, at least, if not the whole harness, can be made of gum-elastic fabrics with economy and advantage. As different parts of the harness are made of different materials, with advantages peculiar to each, they are, therefore, separately described in this chapter.

When complete sets of harness are made, it is necessary that they should be made up at the India rubber factories, in order that the stays or eyes may be cemented in for the buckle holes, and that the caoutchouc whalebone ivory and enamel may be joined to such parts as require it, while the materials are in a soft state, and being manufactured.

The improvements alluded to, by which the difficulties are removed in the manufacture of harness, are, caoutchouc harness leather, and the method of staying the buckle holes, briefly described at the end of this chapter; and caoutchouc whalebone and the semi-hard or non-abrasive compound, described Vol. I., Chapter II.

HORSE-COLLARS.

Attempts were formerly made, both in England and the United States, to manufacture horse-collars of native gum-elastic, to be inflated with air; but these attempts were not successful. The writer, also, made specimens of vulcanized horse-collars, both inflated with air and stuffed in the usual manner, in 1843.

The chief objection to these articles, at that time, was that of galling and sweating the horse.

The kind of collar to which these fabrics are best adapted, is one recently invented, as represented plate , fig. , it is made by a combination of gum-elastic sponge and whalebone, formed in moulds. Perforations are made through the pad or the collar to admit the free circulation of air; that part of it which comes next the horse may be lined with woolen or leather, after the collar is finished, to prevent the gum from galling the horse.

HARNESS SADDLES.

The trees and skirts of these saddles are made of caoutchouc whalebone. The hooks and turrets are plated with caoutchouc enamel. The pads are made either of perforated gum-elastic sponge or of the quilted caoutchouc fabrics. See plate , fig.

HARNESS BRIDLES.

The blinders of gum-elastic harness bridles are made of caoutchouc whalebone, the bits and buckles are plated with caoutchouc enamel, and the reins are made of caoutchouc harness leather; a part of the check-rein being made of elastic compound. See plate , fig.

COVERED BUCKLES.

The covering of buckles with caoutchouc enamel is fully demonstrated to be a valuable improvement. They are manufactured of different colors cheaper, and are better when made, than those that are covered with animal leather.

BAGGAGE STRAPS.

Baggage, trunk, and other straps are made of caoutchouc harness leather, the buckle-holes being stayed by strong linen cord or metal wire, cemented in around the holes or before them, in such a manner as to hold firmly, and prevent the buckle-tongue from tearing out. See plate xxv., fig. 9.

ELASTIC STRAPS.

The baggage, trunk, and other straps above described, are much improved by inserting from one to two inches in length of elastic stayed fabrics, in the strap near the buckle of the strap.

Straps made of animal leather may be made elastic in the same way, by which means they are more easily managed, and bind any article more securely, than those that are unyielding or non-elastic. See plate xxv., fig. 10.

COLLAR PADS.

These are manufactured of ventilated quilted fabrics, or in moulds, in the same manner as horse-collars, being subsequently lined with woolen stuffs, to prevent their galling the horse. See plate xxv., fig. 11.

TRACES.

These are manufactured at the factories only, and are made of caoutchouc harness leather, with the buckle-holes stayed in the same way as the elastic straps before described. There is, perhaps, no article of gum-elastic, or any part of gum-elastic harness, that is made with so great a saving of labor as the traces. This economy of labor is fully demonstrated by the fact, that one girl will make up twenty pairs of gum-elastic traces per day, while it is a day's work for a journeyman saddler to stitch a single pair of traces made of animal leather. See plate xxv., fig. 12.

REINS.

The round parts of these are made of caoutchouc harness leather. The hand-rein is made of the same material, either napped or covered with a light woven fabric.

CHAPTER XXI.

STAGE COACH, AND CARRIAGE TRIMMINGS.

Coach curtains. Improved coach curtains. Hammer-cloths. Coach lace. Coach boots. Wagon and chaise boots. Baggage boots. Baggage covers. Box cushions. Coach and chaise cushions. Improved box, coach, and chair cushions. Improved cushion covers. Carriage dashers. Coach whips, riding whips, and switehes. Coach mountings. Coach trumpets. Improved coach and car sashes. Improved blinds. Improved carriage dashers. Coach pannels.

SOME of these articles which are made of vulcanized gum-elastic, may be considered important on account of their cheapness, in comparison with those which have heretofore been made of other materials for the same purpose.

Others, because this material is comparatively indispensable for their manufacture on account of its water-proof qualities.

Of the latter sort are the cushions for waggons and the driver's box, hereafter described. With the stuffed cloth and leather cushions which have been furnished, drivers are exposed to a vast deal of hardship and suffering during storms, and the evil does not end with the storm. The cushion, or rather the sack of stuffing, becomes completely saturated with water, which continues to endanger their health even more than before, because it seldom, if ever, becomes dry.

The napped and plated fabrics might be highly recommended for the lining of stages and coaches throughout, on the score of quality and cheapness, except that the odor of them may be considered objectionable for close and expensive coaches.

In reply to this objection it may be urged, that as the gum-elastic linings acquire age, they will become free from odor, and remain much more cleanly than cloth linings.

They will not, like cloth, become impregnated with filth and

odor after being much used, more offensive than that of India rubber. They have the further recommendation of not being damaged by the driving in of the rain.

COACH CURTAINS.

Plated canvas is much used for coach and wagon curtains. The best article of this kind is made of knit fabrics, plated with caoutchouc, and finished in imitation of enameled leather.

When coach curtains are made of knit goods, the elasticity of the curtain allows it always to be buttoned tightly, an advantage which is often missed in leather curtains, on account of their shrinking.

IMPROVED COACH CURTAINS.

This curtain is constructed as represented in plate xxvi., fig. 1, with an opening in the middle, and a fall or cover so arranged with buttons or strap that the passenger may open or shut it to obtain light or air without calling upon the driver. In a public stage coach it is a comfort or convenience that may be enjoyed by an individual without intruding upon others.

HAMMER-CLOTHS.

Gum-elastic hammer-cloths are commonly made up with needles, of plated caoutchouc cloth or canvas, napped in imitation of broad-cloths. An article is also made up in the same way, of plated caoutchouc fabrics, and is used as a covering for the broad-cloth hammer-cloths heretofore made. When the article first

described is used for this purpose, there is not only a great saving in the cost, but there is no occasion for the expense of a covering to protect them from wet.

COACH LACE.

This article is manufactured of napped and embossed gum-elastic fabrics, equally ornamental, and much more durable than woven lace.

COACH BOOTS.

These are made of plated and napped gum-elastic canvas, either at the gum-elastic factories or with the needle. The napped canvas presents a woolen surface on the inside, and forms a warm lining, it is most suitable for this purpose, although the plated fabrics not napped may be lined with other goods, like the leather boots which are commonly used. See plate xxi., fig. 1.

WAGON AND CHAISE BOOTS.

These are manufactured in all respects like the coach boots before described, only they are made of a lighter description of materials. See plate xxi., fig. 2.

BAGGAGE BOOTS

Are made of plated and barred gum-elastic canvas felt. They are used for protecting from the weather the baggage placed upon the rack at the hinder part of the coach. See plate xxi., fig. 3.

BAGGAGE COVERS

Are manufactured of plated canvas or strong corded and barred vulcanized fabrics, to suit the coach or vehicle for which they are intended, a suitable number of holes being made around the edge of the cover, by which it is secured over the baggage. See plate xxi., fig. 4.

BOX CUSHIONS.

These have been manufactured in different ways, both stuffed and inflated with air, but they have not commonly been made substantial enough for this use. When properly made, they may be considered more durable than any other kind of cushion, and do not expose the health of the drivers like leather or cloth cushions, which are commonly saturated with water, or frozen from their exposure to the weather.

COACH AND CHAISE CUSHIONS.

See Chapter XXVIII., Air-work.

IMPROVED BOX, COACH, AND CHAIR CUSHIONS.

These cushions are manufactured of perforated gum-elastic fabrics, and stuffed with different materials. In a square cushion, five sides of the cushion are made of the above material, and one side water-proof, with the same fabric unperforated.

The improvement consists in constructing it so that it will be cool in warm weather, and on being turned over, water-proof in storms. See plate , fig. .

IMPROVED CUSHION COVERS.

These are constructed of perforated gum-elastic fabrics, so as to open at the side to admit a cushion of any kind. They are otherwise made upon the plan of the cushions last described, so that one side of the cover is water-proof, while the other sides are porous. See plate , fig. .

CARRIAGE DASHERS.

These are made of vegetable leather, finished in imitation of patent japanned leather, and are designed to answer the purpose of japanned leather dashers. The material of which they are made can be furnished at much less expense than japanned leather, and the expense is lessened much more when the goods are cemented to the frame at the factories. The lustre upon these goods is not so hard, and is, therefore, more easily scratched than japanned leather, but the goods resist the action of the sun and weather much better, and without cracking.

COACH WHIPS, RIDING WHIPS, AND SWITCHES

Are manufactured of caoutchouc whalebone, made in moulds in one entire piece. The cheapness and elegance of these whips give assurance of the success of the manufacture.

Flexible team whips are described, Chapter XIX. See plate xxi., figs. bottom and on the sides, of either the window sash or casing, from one-quarter to one-third of an inch in diameter, and com-

COACH MOUNTINGS.

Different parts of the mountings of coaches and carriages may be covered with India rubber enamel much more cheaply than with brass or silver plate, and may be made much more finished and beautiful than those japanned or covered with leather.

COACH TRUMPETS

Are manufactured from caoutchouc ivory, connected with a flexible gum-elastic hose, covered with braid, velvet, or other stuffs. The use of this trumpet is to communicate with the driver from within the coach. See plate , fig. .

IMPROVED COACH AND CAR SASHES.

An improved sash may be made for coaches, cars, and omnibuses, as well as dwellings, by means of a packing of gum-elastic sponge cord, drawn into a dove-tailed groove around the edge of the sash: this packing operates to keep out the dust and rain, to prevent the annoying rattling noise of vehicles, and also to keep the sash in the place when it is raised. See plate , page .

IMPROVED BLINDS.

An improved blind or screen is manufactured by the use of the finely perforated fabrics, which are designed both for dwellings and travelling vehicles. They operate to exclude the sun, dust, and insects, and to admit air and light. The improved sashes before described, may be constructed in this way, as well as common window screens and shutter blinds. See plate , figs. .

IMPROVED CARRIAGE DASHERS.

This article is manufactured of caoutchouc whalebone, in one entire piece, made in moulds; they are stiffened around the edge either by an extra thickness of whalebone, or an iron rim in the same manner as those heretofore made of leather. See plate , fig.

COACH PANNELS.

Coach pannels may be advantageously veneered with caoutchouc whalebone, and when the supply of gum-elastic is sufficient for such uses, entire coach bodies may be made of the same material with still greater advantages. In this case, the mortices and the tenants which unite the parts will be made of cast iron, inserted while the gum is in a plastic state, and the parts are being moulded.

CHAPTER XXII.

FANCY AND ORNAMENTAL USES.

Daguerrotype frames and boxes. Fancy boxes. Looking-glass and picture frames. Improved picture frames. Portable picture frames. Ornamental mouldings. Fancy baskets. Gimps. Coach lace. Banners and flags. Fringes and tassels. Pocket-books and wallets. Walking sticks, or canes. Meerschaums. Medallions. Cameos. Umbrella and cane heads. Plated ornaments.

Numerous fancy and ornamental articles may be made from the different vulcanized caoutchouc compounds, including the whole assortment that have heretofore been made of gutta percha in its native state. Some things made of the softer compounds, such as gimps, fringes, tassels, &c., are of less importance; but it is obvious that those articles which are made of the hard compounds entirely, and also those which are enameled with these materials upon wood and metal, are better on many accounts than the same articles made of many other substances. The superiority of articles made of these materials consists,

First, In their extreme hardness and susceptibility of polish, which is given them simply by the smoothness of the forms in which they are vulcanized.

Second. They are not liable to crack or warp.

Third, They are much harder, and stronger than the same articles made of wood, plaster, and other compounds, because they are made in one entire piece without seam.

Fourth, They admit of the numerous styles of finish, like other substances, such as inlaying, embossing, &c., while the expense of manufacturing is less than that of the same things made in separate parts of wood, and other materials. It is sufficient to specify a few of the applications of the substances for these purposes.

DAGUERREOTYPE FRAMES AND BOXES.

Are manufactured of caoutchouc ivory and whalebone. The frames are much lighter, stronger, and more durable than those made of wood. The tops, and also the bottoms of these boxes are made of one entire piece, in moulds; they are stronger and more durable than those made of wood, covered with leather.

FANCY BOXES.

Fancy boxes of all kinds, together with many small articles appertaining to them, are made of the hard caoutchouc compounds. Among these may be enumerated, dressing-boxes, work-boxes, snuff and tobacco boxes, &c. They are made plain and polished, or with little expense are beautifully inlaid and embossed.

LOOKING-GLASS AND PICTURE FRAMES.

The same general remarks that have been made as regards the qualities of daguerreotype frames may be applied to looking-glass and picture frames. Another desirable quality of these frames is their lightness, as they can be made very thin owing to the great strength of the materials, and being manufactured in moulds, in one entire piece.

IMPROVED PICTURE FRAMES.*

This article is made of caoutchouc whalebone. It is manufactured in the same way as other caoutchouc whalebone picture frames, with the addition of a revolving roll at the bottom, such as is sometimes used for rolling up coach curtains. This roll, which is self-acting by means of a spiral spring coiled within it, operates to roll up any fabric that is attached to it. It is placed behind the frame at the bottom, and the scroll upon it is drawn out by a tassel. It is proposed to make these scrolls of gum-elastic tissue or drapery, on which a catalogue or any description of the subject may be printed. See plate xxii., fig.

* Invented by Mr. John Wood, Philadelphia.

PORTABLE PICTURE FRAMES.

See Chapter XXIV.

ORNAMENTAL MOULDINGS.

The superiority of these materials for ornamental mouldings, for furniture, &c., compared with native gutta percha, is worthy of notice.

These articles made of the caoutchouc whalebone are not only much lighter, but stronger than when made of the native gutta percha. They are not, like gutta percha, easily indented, and are not softened by a hot sun, or hot water, and will bear harder blows without indentation than brass or iron.

FANCY BASKETS.

Work-baskets and other fancy baskets are made of wicker-work, such as is described in Vol. I., and of whalebone thread instead of willow or cane, they are also made of thin sheets of perforated caoutchouc whalebone. The advantages in the use of these materials for baskets are, that they are very durable and are not injured by being crushed.

GIMPS.

Gimps are made of vellum cord; black gimps may also be made of threads or strips of caoutchouc whalebone.

COACH LACE.

See Chapter XXI.

BANNERS AND FLAGS.

Gum-elastic vellum and tissue are cheap and durable articles for banners and flags. The reader will be able to form his own judgment of the suitableness of the fabrics for this use, from the maps and plates of this work.

FRINGES AND TASSELS.

These are made of gum-elastic cord, which is spun and twisted while the gum is in a soft state, with the same facility as common thread.

The brilliancy of color is not in all cases equal to that of dyed silk, but it possesses the advantage of being unfading, and the goods are not readily injured by being soiled. Articles of this sort may, at least, be found useful for coach trimmings, &c.

POCKET-BOOKS AND WALLETS.

These are made of gum-elastic vellum in imitation of morocco, calf-skin, and Russia leather. Tissue is suitable for lining them, and for gussets, as well as for the gussets of pocket-books made of leather. These goods seem adapted to every variety of pocket-books and portfolios, which are subjected to usage that exposes them to friction and dampness; such usage tends to destroy leather very soon, but makes comparatively little impression upon the gum-elastic fabrics.

WALKING STICKS OR CANES.

Although there are numerous kinds of natural wood that are both cheap and beautiful, and good enough for this purpose, yet the caoutchouc whalebone has been deemed so well adapted to this use on account of its toughness, hardness, and elasticity, that it is the first article of the hard compounds of which the regular manufacture is commenced. These canes, which may be afforded cheaper than canes made of the finer kinds of wood, possess great advantages over them in point of lightness, strength, durability, smoothness of surface, beauty and variety of colors, and brightness of polish.

MEERSCHAUMS.

The caoutchouc compounds are well-adapted to the manufacture of meerschaums.

The caoutchouc enamel and ivory, when lined with porcelain or metal, is suitable for the bowls, and the elastic compound and whalebone are equally adapted for the tubes and stems of meerschaums. See plate , fig. .

MEDALIONS.

Medalions are made of caoutchouc ivory and whalebone, in exact imitation of bronze, both as to color and finish. These medalions are light, and have the hardness of marble; they are less liable to injury in handling than either silver, gold, or bronze, and are moulded with equal facility as plaster, after which they are vulcanized.

CAMEOS.

Cameos and broaches of different kinds are manufactured of caoutchouc ivory, which closely resemble those which are made of other materials. This substance has a decided advantage for these uses, such as lightness, strength, combination of colors and facility of manufacture; but before deciding that there is any improvement to result from this application, it may be necessary to know whether a material can be adopted for ornaments which is not "dear bought and far fetched."

UMBRELLA AND CANE HEADS.

The heads of umbrellas, canes, whips, and other articles are manufactured of caoutchouc ivory and whalebone with economy and advantage. They are moulded with the same facility as pressed horn, and are equally, if not more durable, than any other material from which such articles have heretofore been made. See plate , fig.

PLATED ORNAMENTS.

Some ornamental, as well as numerous useful articles, are made according to an invention that is briefly described in Vol. I., page 111, of this work. It consists in plating or covering the articles with silver or gold foil, such as canes, walking sticks, whip heads, &c. Other articles, such as drinking cups, pitchers, trays, servers, &c., are lined in the same way, upon the inside. In both cases the work is done by placing the foil upon the article where it is fastened by the pressure of the mould, when the article is vulcanized.

CHAPTER XXIII.

AIR-WORK.

Air-work. Self-inflating air-work. Cushions. Boat cushions. Ventilated boat cushions. Self-inflating cushions. Ventilated cushions. Invalids' cushions. Coach, chaise, and box cushions. Pillows. Self-inflating pillows. Ventilated pillows. Beds. Cape and poncho beds. Ventilated beds. Self-inflating beds. Hospital air-beds. Observations on life-preservers. Life-preservers. Pocket life-preservers. Cushion life-preservers. Pillow life-preservers. Satchel life-preservers. Jacket life-preservers. Nautilus life-preservers. Self-inflating nautilus. Life-preserving wearing apparel. Life-preserving bathing dresses. Balloons. Gas bags. Directions for mending air-work.

THIS is a term which has been technically applied to all articles that are inflated with air. It was to such articles as beds, pillows, life-preservers, cushions, &c., that India rubber was, in the early stages of the manufacture, most commonly applied, and from them the greatest advantage was, at that time, expected; perhaps even more than from clothing, shoes, or suspenders. Little benefit, however, has been derived from air-work as yet, in comparison with other branches of this manufacture; the demand for this class of articles has increased very little, if at all, since 1838, and notwithstanding the improvements made in the gum by the heating or vulcanizing process, air-work has not come into favor with the public as might have been anticipated. The reputation of this class of goods was nearly lost from the imperfect manufacture of the goods, before the heating or vulcanizing process was introduced, and from the use of metal tubes, to which gum-elastic will not adhere firmly.

The cost of the articles, considering their liability to be lost, by the slightest damage or defect causing leakage, or escape of the air, has been quite too great. This expense has been owing partly to a limited demand, but very much to the complexity of their construction, and the quantity of materials necessary to

make them, as may be seen by any one who has an opportunity to examine the internal construction of a bed, or cushion, of the common kind. The odor of the goods, and their being uncomfortably warm, have presented, in addition to the cost, the great objections to their use.

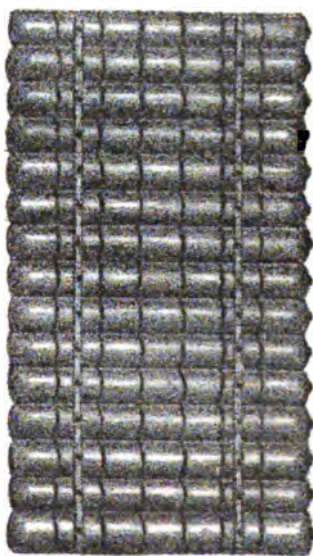
By the use of the gum-elastic tube, which is cemented in so as to form part and parcel of the article, the danger of leakage in that part is completely removed; and in the ventilated air-work, the objection of warmth is wholly removed. By the new method of manufacture by machinery, in the use of the laminated fibrous fabrics, an entire change in the manufacture of air-work is anticipated. The peculiar properties of these fabrics, and method of manufacture alluded to, lead to the conclusion that cheaper and better articles will be produced. And it may be hoped that in consequence of the improvements here noticed, and the reduction of the cost of the articles, they will eventually come into as general use as was at first anticipated.

The mechanical construction of air-work is chiefly of three kinds. That which was first made, and was one of the earliest manufactures of gum-elastic; ventilated air-work, which has been described, Vol. I., page , and the self-inflating air-work, described as follows:

SELF-INFLATING AIR-WORK.

This is a style of work, some specimens of which were made by the writer as early as 1838, but it could not then be made to any advantage, in consequence of the gum peeling off the woven cloths, and causing the compartments to pull apart, and owing to their want of sufficient firmness. In consequence of the improvements described in this work, it is believed that this class of air-work may now be made with advantage.

It is somewhat more expensive and difficult to manufacture than other kinds of air-work described in this chapter, but it is



much more convenient on account of its being easily filled, simply by pulling it open. The labor of inflating air-work, and particularly beds, whether with a bellows or the mouth, has ever been found a great objection to it. This objection does not apply to the work here described, as it can be filled instantly when needed; and when not in use it may be packed away in a very small compass. The method of constructing this article, although it might appear very complicated, is indeed very simple. Every compartment is first formed separately. A sufficient number of them to form the article are next cemented together firmly, about half the distance from the centre to the outer edge. The different compartments are each inflated by separate tubes, or any number of them are inflated by one tube, when they are so constructed that the air may pass from one to the other.*

Thin sheets of India rubber whalebone board are cemented in between the cells, which, if they should become leaky, render them more firm and safe when in use, by keeping them from collapsing even.

This contrivance now makes this article available, which was before useless for the want of firmness in the cloth to cause the article to inflate itself. It also gives the article that degree of stiffness which causes it to resist the pressure of the water, and prevents a leak from rendering it unsafe, which would cause one of the common kind to collapse and sink immediately.

CUSHIONS.

These were among the articles first manufactured of the McIntosh fabrics, both in Europe and the United States, but neither these or the different kinds that have since been made, have been much used in comparison with what might have been expected, considering the length of time since they were first

* The life-preserver being more or less safe according to the number of cells inflated by each tube.

introduced. The reasons have been, undoubtedly, their expensiveness, their liability to be damaged, so that the air would escape from them, and their being uncomfortably warm.

It is believed that, by the new method of manufacture from the fibrous fabrics, they will now be furnished at extremely low prices. The objection of warmth is entirely removed in the ventilated articles, so that they are even cooler than other stuffed leather or cloth cushions, and the risk of damage to those filled with air, need hardly be considered, since when they are not made so as to be stuffed through the tubes, they may be cut open underneath and stuffed, so that they will answer all the purposes of leather and cloth cushions, after they are damaged. Those inflated with air are often found very comfortable for invalids. Their superiority is most apparent when used for riding, either in coaches or wagons. A journey will be found much less fatiguing with them than with any other cushion. Those made of the light fabrics, and the self-inflating, are designed chiefly for this purpose, as they may be packed in so very small a compass that they may be carried in the pocket for occasional use. Settees, as well as chair cushions, especially those that are made in separate compartments, may be highly recommended for use on board of steamers and vessels, since, when trimmed for the purpose, with suitable fastenings, they will form infallible life-preservers. The common patterns, inflated by a single tube, are represented in plate xxvii., figs. 1 and 2. Those made in separate compartments, and inflated by a number of tubes, are represented by fig. 3.

BOAT CUSHIONS

Are made of plated canvas or elastic knit goods, and inflated by one tube, as represented by plate xxvii., fig. 4, or like fig. 5, with a self-acting valve tube in each compartment, in order that they may be stuffed, if desired. In case of accident, these

cushions will form an excellent life-buoy, for which reason they should not be so firmly attached to the boat as to prevent their being used in case of accident.

VENTILATED BOAT CUSHIONS.

These are manufactured of quilted fabrics, perforated between the compartments or cells, as represented, plate xxvii., fig. 6.

This style of work is particularly adapted to boats, for the reason that the water is immediately drained off from them.

SELF-INFLATING CUSHIONS.

Self-inflating cushions may be best made of plated fabrics, and may be recommended chiefly on account of their compactness when collapsed, and of the ease with which they are filled like other self-inflating articles. When they are made with the self-acting valve tube for each compartment, in case they become damaged so as not to retain air, they may be stuffed through the tubes with any suitable material, such as ground cork, chopped gum, elastic sponge, curled hair, or moss, in which case they will answer all the purposes of a stuffed leather cushion. See plate xxvii., fig. 7.

VENTILATED CUSHION.

These are made of the quilted fabrics, to be inflated with one tube, as represented by fig. 8, plate xxvii., or with a tube for each separate row of cells, as represented by fig. 9. Cushions of this pattern are not liable to the common objections to air cushions, that of being uncomfortably warm, and rolling about.

INVALIDS' CUSHIONS.

See Chapter

COACH, CHAISE, AND BOX CUSHIONS.

See Chapter

PILLOWS.

The style of pillow represented by fig. 10, is also one of the articles first made in England and the United States, of the McIntosh fabrics. When made of the plated fabrics, and inflated with the gum-elastic self-acting tube, this is the cheapest of the various kinds of cushions.

If inclosed in a pillow-case, and trimmed with suitable fastenings when used on shipboard, they may also be used as life-preservers. The chief objections to this pattern are their warmth, and their liability to roll about.

SELF-INFLATING PILLOWS.

Like other self-inflating air-work, these are manufactured to be inflated with one tube, or with a tube to each compartment, they are designed to be used on shipboard as pillows, and if required, as life-preservers; although, like the kind before described, they are objectionable as pillows on account of their warmth. See plate xxvii., fig. 11.

VENTILATED PILLOWS.

The objection to gum-elastic pillows, on account of their warmth and rolling motion, is almost wholly, if not entirely removed by the invention represented in plate xxvii., fig. 12. When folded, it is used for a pillow; when opened, as represented, plate , fig. , it is designed to be used as a life-preserver when required. This may be considered one of the safest kinds of life-preservers, especially when stuffed with cork or curled hair, on account of affording protection from injuries to the person.

BEDS.

The air bed, represented by fig. , plate , is one of the articles first made of the McIntosh manufacture; and when made of the plated fabrics, after the method described, page , is the cheapest article of air beds; although the same pattern, represented by fig. , with a tube for each compartment, is much more secure from being damaged, and is not much more expensive.

CAPE AND PONCHO BEDS.

These are manufactured of the improved air and quilted fabrics, described Vol. I., page .

When each row of compartments or cells in this poncho, which are usually from thirty to fifty, are inflated by a separate valve tube, at least two-thirds of them must be damaged before the bed will be unsafe in the water.

Where the cells, in all about six hundred, are stuffed with curled hair, each being separated from the other, two-thirds of these may be rent or damaged before the bed will become unsafe as a life-preserver. See plate , fig. .

VENTILATED BEDS.

These are also made either of the air-work or quilted fabrics, and perforated, as represented in plate , fig. . Their chief recommendation is that they are not like other gum-elastic beds, uncomfortably warm in hot weather, and when the rows of cells are inflated by separate tubes, and especially when stuffed with curled hair, they are more secure from being damaged than any other gum-elastic bed.

SELF-INFLATING BEDS.

These are manufactured like other articles of self-inflating air-work, and are inflated either with one tube, or with separate tubes for each cell or compartment.

On account of the ease with which they are filled, and the certainty of their retaining the air when the cells are inflated separately, they are superior to other air beds for persons who are travelling, when they are not certain of finding beds, or are not satisfied with the quality of those they do find.

HOSPITAL AIR BED.

See Chapter

OBSERVATIONS ON LIFE-PRESERVERS.

In addition to the circumstances that have been noticed, which have tended to prevent India rubber air-work from coming into general use, there are others which have operated against life-preservers in particular.

These articles, in whatever form they are made, are in no case to be depended on as infallible life-preservers, when simply inflated with air in one apartment, as they have commonly been made. The self-inflating life-preservers, which are kept distended by braces of whalebone board, and the nautilus life-preservers, are much the safest. The common kinds, also, of different patterns, particularly those which are made in two or more compartments, with separate tubes, (as they may now be afforded at extremely low prices,) are useful either as swimming belts or life-preservers, and may save many lives, if they are not too much depended on, to the neglect of other means of safety; but if they are, as many lives may be lost as saved by the common kinds, filled with air only. It is well known that some lives have been saved by them; an instance, however, has come to the knowledge of the writer, of the captain of a ship who ran the risk of leaving his vessel, depending on a life-preserver, and was lost, while those who remained in the vessel were saved.

The value of an article depends chiefly upon the certainty of its answering the purpose for which it is designed. When it does so, and the purpose is a good one, if the price is reasonable, the article is sure to come into general use.

An instance which enforces this idea is found in the fire-proof safe. Notwithstanding its expensiveness, it has, in a few years, come to be considered among merchants an article of necessity; whereas, although it is twenty years since life-preservers were first introduced, yet they do not come into favor as was expected, nor as they would have done if they had really been what they

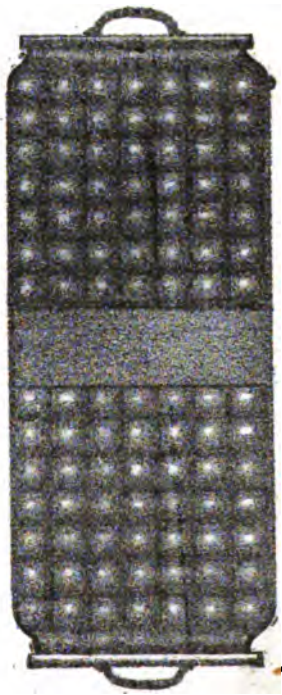
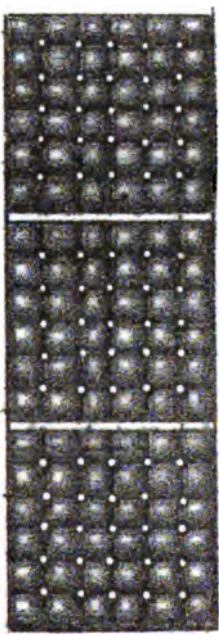
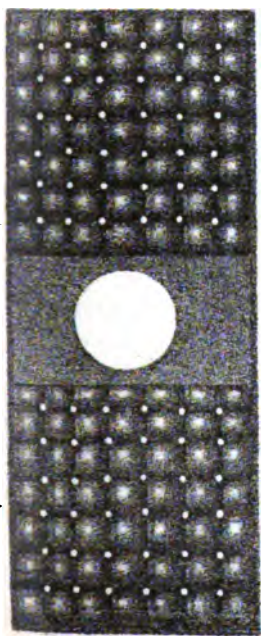
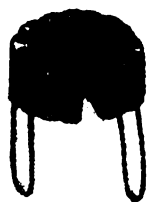
are called, "Life-Preservers." Notwithstanding the price has been reduced to one-half what it was, yet the demand and sale of them is not half so great as it was fifteen years ago.

One great difficulty in making life-preservers, as well as every other description of air-work, to answer the purpose for which it is designed, has been the impossibility of uniting India rubber to metal, and none but metal tubes have, heretofore, been used for inflating them. Although when first made with these tubes they may be tight, very often, after a little wear, the air escapes between the gum and the metal. By the invention of the gum-elastic tube, (which is also self-acting, and much more safe on that account, and which can be made for a trifle in comparison with the metal tube,) this difficulty with metal tubes is completely obviated.

By removing the defects which have been enumerated, by the improvements treated of in this work, it is hoped that gum-elastic life-preservers, which are really of great value, if well made and properly used, may be made great blessings to mankind.

LIFE-PRESERVERS.

The kinds of life-preservers with which the market has been chiefly supplied, are represented by figs. 1, 2 and 3, in plate xxvii. They are less safe than any of the other patterns that are represented in the plate. The article represented by fig. 4, is after the same pattern as fig. 1, made in the same way, except that the compartments do not communicate, and they have each a separate tube. This arrangement, which is a consequence of the invention of the self-acting gum-elastic tube, makes life-preservers, filled with air only, comparatively safe, although they are more troublesome to inflate than the self-inflating air-work. The metal tubes formerly used would not only be too heavy, but quite too expensive for such an arrangement with many tubes, even if there was no other objection to their use.



POCKET LIFE-PRESERVERS.

This article is made as represented by fig. , plate xxvii., and is designed to be put in cloth garments, such as vests, coats, and cloaks. When the compartments are inflated by separate tubes, they may be considered quite safe, and the more so, because they are protected from damage by the garment. They may be considered the cheapest, most unobjectionable, and convenient of all life-preservers which are filled with air only, as they are always at hand with the garment, and may be worn sufficiently inflated to save a person from drowning, when there is any apprehension of danger, without attracting the observation of others. This may be deemed an important recommendation, as many persons, and particularly sailors, would sooner be exposed to drowning than to ridicule from wearing a bag of wind, although in the form of a life-preserver.

CUSHION LIFE-PRESERVERS.

This is the same article, designed for ship's use, described as a cushion when folded, page . When quilted or inflated by separate tubes for each compartment, it is among the safest of life-preservers.

PILLOW LIFE-PRESERVERS.

This is another of the articles designed for ship's use, and described as a pillow, page . When unrolled, put on over the head, and fastened around the person, this is also one of the safest of life-preservers, because it affords the best protection to the person from blows or injuries.

SATCHEL LIFE-PRESERVER.

This article is the same as that described as a double satchel, or travelling-bag, page . When filled with clothing, or inflated with air, it answers the same purposes as the two kinds before described, as a life-preserver.

JACKET LIFE-PRESERVER.

This form of life-preserver has been introduced to some extent in the United States.

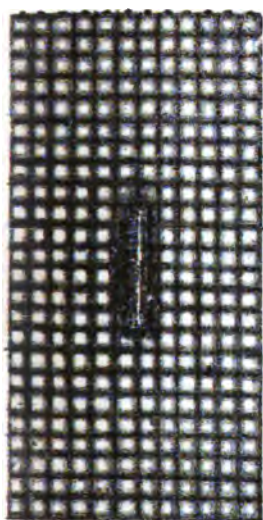
When the article is made in separate compartments, and inflated in separate tubes, it may also be considered a good and safe one. An improvement has recently been made in these jackets by perforations between the compartments, like the ventilated cushion life-preservers. See plate , fig. .

NAUTILUS LIFE-PRESERVER.

The nautilus life-preserver, which is represented by fig. , was patented in the United States in 18 . It consists of a spiral wire, covered with gum-elastic fabrics, in one apartment, but is somewhat objectionable on account of its bulk. This article may be considered a safe life-preserver, but not so safe as the self-inflating nautilus.

SELF-INFLATING NAUTILUS.

This is manufactured like the self-inflating beds and cushions before described, except that the stiffenings between the com-



partments are made of rigid whalebone board, instead of flexible caoutchouc whalebone.

When each compartment of this nautilus is inflated by a separate tube, it is not only one of the safest, but also one of the most compact of life-preservers.

LIFE-PRESERVING WEARING APPAREL.

See Chapter

LIFE PRESERVING BATHING DRESSES.

For descriptions of these, see Chapter , and diagrams, plate , figs. 18, 19 and 20.

BALLOONS.

It has often been suggested to the inventor by others, that the vulcanized fabrics would answer well for balloons. As yet there has been no trial of the article upon a large scale, but from repeated trials upon a small one with globes, there is every reason to suppose that the corded gum-elastic vellum would answer well for this use ; and if so, it would certainly be stronger, and cost less by half than oiled silk. The cost of a silk fabric, coated with gum-elastic for this purpose, would be about the same as that of oil silk, although being cemented instead of stitched, the workmanship of the gum-elastic balloons would be much the most complete, and cost much less than that of the oil silk, as they are now made.

GAS BAGS.

DIRECTIONS FOR MENDING AIR-WORK.

When any article of air-work is damaged, the place where the air escapes may often be detected by applying it to the face or ear. When the article is fully inflated, a surer way is to wet it upon the outside, or immerse it in water, when, on being pressed with the hand, the leak will commonly be found by the bubble which is caused. A more searching trial is, to fill the article wholly or in part with water, and press it. The escape of air must be very slow, and the leak of little or no consequence, not to be found in this way.

When found, a few drops of gun cotton varnish, or what is called collodion, applied to the spot, will often effectually stop a small leak. A larger leak may sometimes be stopped with a few drops of hot sealing-wax, or shoemakers' wax. The above are recommended only as expedients where the vulcanizing cement is not conveniently to be found. If the rent is large, it should first be drawn up with a needle and thread, and the vulcanizing cement applied in two or three alternate coats, each of which dry in an ordinary temperature of a warm room in from fifteen to twenty minutes; the part which is coated with the cement should afterwards be exposed to the rays of the sun for about

half a day, for the purpose of removing the adhesiveness from the cement.

Another expedient for making damaged air-work useful, if not more valuable than before, particularly cushions and beds, is to cut the cells or compartments as neatly as possible on the under side, and stuff them with curled hair, moss, or any other suitable material; on the cuts being closed again, as above described, the articles will answer all the uses of those which are stuffed in the first manufacture.

CHAPTER XXIV.

MISCELLANEOUS.

Umbrellas. Parasols. Bank notes. Portable picture frames. Transparencies. Money belts. Tape measures. Wheel-barrow tire. Wheel-barrow shoulder-straps. Covered iron furniture. Umbrella frames. Bedstead castors and shoes. Chair shoes. Cartmen's wallets. Ox-buttons. Nose baskets. Grafting bandages.

THE articles which are described in this chapter are such as are considered not to belong to any particular class of articles more than another, for which reason they are described as miscellaneous.

The diagrams which are given of some of these articles are interspersed among the different plates, as noticed in the descriptions.

UMBRELLAS.

Umbrellas were made of muslin coated with India rubber, by the Roxbury Company, as early as 1837; but owing to the adhesiveness and decomposition of the unvulcanized gum, the manufacture was abandoned.

The writer has ever considered this as one of the most appropriate uses of gum-elastic, and for years past has occasionally made an umbrella for trial, and at every trial he has been confirmed in his opinion of the utility of this invention, though

some modification of the fabric for this use has, until now, seemed desirable. The recent improvement of the fibrous fabrics will greatly facilitate this branch of the business, both on account of the cheapness and lightness of the material.

Umbrellas are made either of tissue, corded tissue, or plated muslin. The frames are covered with the scraps of the material. The covers being cemented together, are then cemented on to the frame, quite to the tips. By this means a large umbrella is obtained with a small frame. The fabric being quite non-elastic, the edge of the cover remains straight from tip to tip, by which means the curve which is unavoidable in cotton and silk umbrellas, is prevented. There are at least four inches gained in the spread or diameter of the umbrella; in other words, a twenty-eight inch frame umbrella made from these fabrics, is as large as a thirty inch covered with cotton or silk. Still more may be gained in the size of the umbrella, by extending the cover by a stay of non-elastic compound, beyond the tips of the frame. It should be understood, however, that when it is preferred, the same form and symmetry may be given to these as to cotton or silk umbrellas, by cutting with a curve, the edges of the sections of which the umbrella is made. Each seam is cemented to the bow its whole length, which gives additional strength and firmness to the cover, and fastens it more securely to the frame than is ordinarily done by stitching.

It is needless to say that these fabrics are impervious to water, and therefore umbrellas made from them form a complete shelter from rain. They are very durable, and do not absorb water to be carried within doors, like cotton or silk.

If there is any one purpose to which gum-elastic is adapted without objection, it is doubtless that of umbrellas.

PARASOLS.

This may be considered too fanciful an article to be manufactured from these fabrics at the present day, and yet it may be claimed that the drapery tissue, and corded tissue, and coated florence, are fine and delicate enough to answer this use. It, however, remains to be decided whether these fabrics are sufficiently freed from the odor of the gum to be used for this purpose. The parasol or shade, which is made without a frame, to be inflated with air through a caoutchouc ivory handle, with a valve at the end of the handle, is noticed simply as a curiosity, without any pretensions as to its practical utility. See plate , fig. .

BANK NOTES.

Specimens of bank notes have been made upon tissue, which are excellent imitations of tissue paper bank notes, and which, in many respects, and particularly as regards counterfeiting, possess great advantages over paper. The first cost of this material is greater than that of bank note paper, and whether it is an application, all things considered, that will obtain the approbation of banking institutions, is a subject for discussion. That they would be highly approved by the public if issued, there is little doubt, for the following reasons. Even if the secret of their manufacture were known, it would be an exceedingly difficult matter to counterfeit them. The counterfeiter would have an additional trade to learn, more confederates to employ, and would be much exposed in the manufacture to detection, by the chemical processes that are used, the fumes of which it would be difficult to conceal. In regard to cleanliness, these notes would possess immense advantage. Few substances are less objectionable on account of odor than these notes. They can be cleansed as easily as glass, by washing or boiling, without injury to the tissue or the engraving, which defies the powers of chemistry either to extract the ink or to alter the

signature. Bank notes in the United States are kept in circulation until they are completely worn out; they pass through hands of every hue, and through pockets of all grades, until they acquire an odor that would be quite insufferable in any other article, to those who have any regard to cleanliness. Should we not be as particular in respect to the cleanliness of money as to other things? The indifference of the public on this subject can hardly be accounted for, except upon the supposition of its being taken for granted, that there is no remedy. Notwithstanding the first cost of these notes being more, it is believed in the end they will be cheaper, on account of their greater durability.

PORTABLE PICTURE FRAMES.

Gum-elastic pictures, prints, and engravings are made with portable frames of the same material, which may be either gilded and bronzed to imitate wooden frames, or colored in imitation of different kinds of wood, all of which is done very cheaply. For further description of this kind of frame and its uses, see framed maps, Chapter I.

TRANSPARENCIES.

These are made of gum-elastic tissue. There may not only be a great saving of expense in the substituting the tissue for silk or canvas, for transparencies, but the work may also be lithographed or colored, in a style highly superior to that in which they are commonly executed.

MONEY BELTS.

These are made of coated gum-elastic vellum or coated florence, with the mouth so constructed that they may be made air and water tight, by which means papers and bank notes may be kept safe and dry; and if well filled, or inflated by means of the small tube which is attached, they answer in good part the purpose of life-preservers.

TAPE MEASURES.

These may be cheaply made of gum-elastic vellum, printed in the piece, and cut in strips. Besides the advantage of durability, they possess another, that of being quite inelastic. The desirableness of a good cheap article of this sort, is best known to carpenters and tailors.

WHEEL-BARROW TIRE.

This is an English invention for preventing the noise of wheel-barrows in ware-houses, at railroad stations, &c. For this purpose, a rim of vulcanized gum-elastic is fastened around the tire of the wheel-barrow.

WHEEL-BARROW SHOULDER STRAPS

Are formed of a strap made of gum-elastic plated fabrics, with a piece of stayed gum-elastic compound, from two to four inches in length, inserted in each end of the strap. The advantage gained by this, is to relieve the laborer of the jar of the barrow, by the elasticity of the strap.

COVERED IRON FURNITURE.

Iron furniture, such as bedsteads, chairs, settees, &c., has long been made, and although stronger, and evidently possessing many advantages over wooden furniture, it has obtained favor but slowly with the public.

This may be owing in a great measure to the forbidding aspect of the material, and to the idea one has of its repulsive properties, coldness and hardness; and possibly more or less to the idea that the bedsteads are dangerous to sleep on in a thunder-storm.

It is here proposed to make the article in the usual manner, either of wrought, cast, or malleable iron, or in parts as suggested by the diagrams, plate , and to cover them first with cotton wadding, and afterwards with vellum, colored in imitation of mahogany or rosewood.

Iron furniture is also enameled with caoutchouc enamel, in imitation of rosewood and mahogany, and various other styles which surpass them in hardness and finish. ticle, than in the use of furniture made of wood, especially where the gum-elastic shoes or castors are used.

UMBRELLA FRAMES.

Some recent experiments in the manufacture of umbrella frames from India rubber whalebone and ivory, give the writer assurance that this is a valuable application of this substance. An improvement is contemplated, and practically tested, so far as to make specimens of umbrella frames, by making use of gum-elastic in all the parts. The very great difficulty of making substantial joints with such slight materials as the frame of an umbrella is made of, must be apparent to all. The extremely low price of this description of work, will hardly allow the manufacturer to make them as carefully as they might be made. It would not be possible to make them so that they would not easily break or get out of repair, after the rivets and joints become rusty. The experience of almost every one has taught them, that loss and annoyance is the frequent consequence of these defects.

An improved umbrella is made by the use of caoutchouc whalebone instead of whalebone for the bows, elastic compound for the joints instead of wire and metal, India rubber fabrics for the covers, and gum-elastic ivory for the sticks.

BEDSTEAD CASTORS AND SHOES.

The metal part of these castors is made of the common form, with the difference that the wheel has a groove, into which a ring or tire of elastic compound is fitted, as represented in the plate , fig. . Shoes are also made for bedsteads, like the chair shoes hereafter described. The design of both the above articles is to prevent noise and the wear of carpets.

CHAIR SHOES

Are made of *gum-elastic sponge*, or elastic compound, in the same manner as hollow ware ; in this way an elastic ball or foot of any required shape is made, that is fitted into a socket which fits the foot of the chair, as represented in the plate , fig. 1 and 2.

The socket may be made of brass or iron, or of caoutchouc ivory. When made of the latter material, it is attached to, and forms a part of the shoe.

The improvement consists in preventing noise and the wear of carpets. Another consideration, which will probably be deemed of importance by many, is perhaps worthy of notice. It is a well-known fact, that gum-elastic is one of the best non-conductors of electricity. It is so completely so, that a person having on India rubber shoes, sitting upon a chair of this kind, or lying upon a bed provided with similar shoes, need have little apprehension of danger from lightning.

CARTMEN'S WALLETS

Are made of vegetable leather. They are commonly attached between the two front stakes of the cart, and used by cartmen as a sort of portfolio or pocket, for containing papers, or other light articles, which it is desirable to keep dry.

OX BUTTONS.

These are made of gum-elastic sponge, in the same manner as hollow ware, as a substitute for the metal article heretofore used.

The advantages of this article are obvious. They may be made much larger, and being lighter than those made of metal, they will not cause the horns of cattle to drop in their growth; and being soft, there will be less danger of vicious cattle goring one another, or their owners with them.

NOSE BASKETS.

Nose baskets are made of wicker-work, and may be suggested to the notice of those who are curious, or careful about the accommodations for their horses and cattle.

GRAFTING BANDAGES.

This article is made of heavy gum-elastic drapery, and is intended to keep the clay moist as well as secure, which is placed about grafts in grafting trees. In grafting trees for this purpose, there should be a large proportion of lampblack, or carbon, compounded with the gum, in order to make it stand well the effects of the sun and weather.

CHAPTER XXV.

APPENDAGES OF WEARING APPAREL.

Buttons. Suspenders, or braces. Improved suspender. Suspender ends. Ladies' elastica. Improved ladies' elastica. Stays, corsets, and braces. Pantaloon straps. Hat pockets. Hat covers. Hat and cap springs. Foot holders. Shoe springs. Improved shoe springs. Vest springs. Glove springs.

THESE appendages consist chiefly of a variety of springs, designed or arranged for the comfortable adjustment of wearing apparel. Particular attention has formerly been paid in Europe to the manufacture of these articles from the native gum, and the mechanical execution of them has therefore been brought to a higher state of perfection there than most other articles of gum-elastic. They are, however, fast being superseded, both in Europe and America, by articles of the same kind, (together with many others recently invented,) and made from the vulcanized gum-elastic.

BUTTONS.

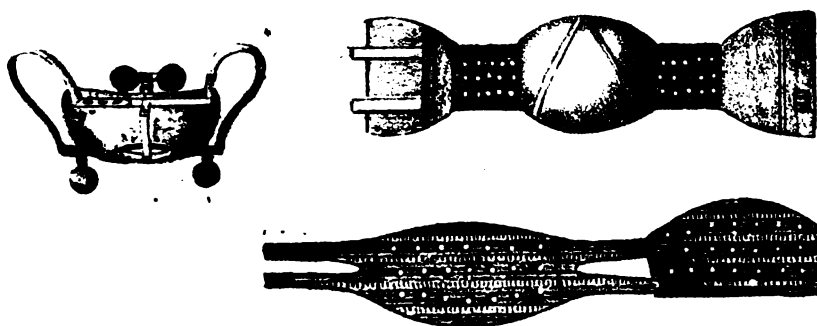
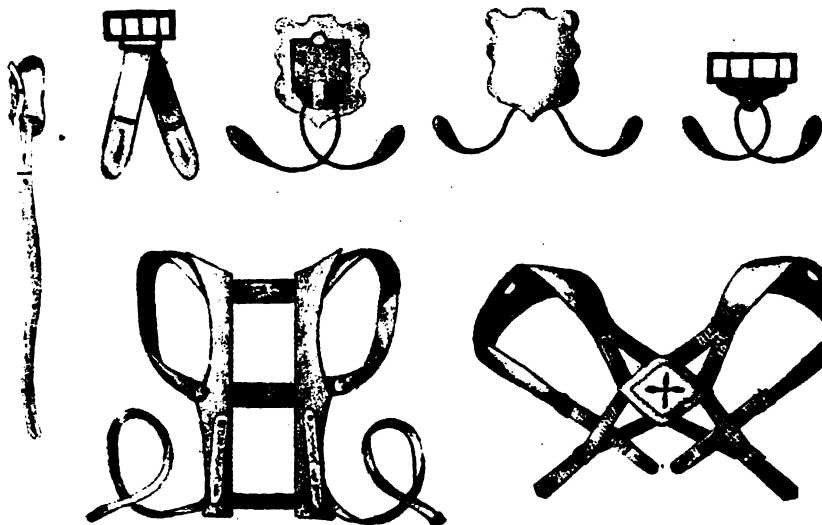
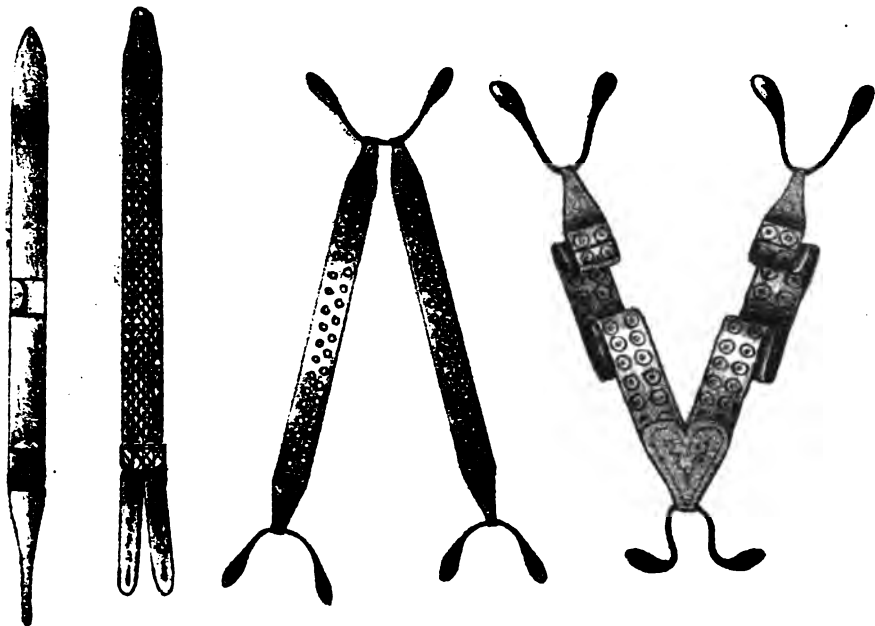
Finding caoutchouc compounds applicable to buttons, a branch of business which the writer supposed he had long ago relinquished altogether, his early associations are awakened, and were it not a digression, he would be strongly inclined to write a lengthy article on the art of button making, which, with many interesting particulars connected with it, would afford ample materials for a volume. As a branch of industry and merchandise, few persons consider the extent or importance of it, or that this trifling article is indispensable for comfort and convenience, making a large item of necessary expenditure, as well as that

which is connected with fashionable display. It is curious to observe of what variety of materials buttons are already made, viz., wood, bone, horn, ivory, shell, pearl, tin, iron, steel, brass, britannia, gold and silver plate, and sometimes of gold, silver, and precious stones, together with combinations of the above materials and silk, linen, woolen, and cotton threads and stuffs. Added to all these, caoutchouc is deserving of notice for buttons. Its water-proof quality resisting the effects of boiling water, also the economy and facility with which this material is worked, recommend it for this use, particularly for the dead eye and cheaper kinds; and also for the more expensive kinds, which are cheaply made from this material in imitation of bronze, metal, figured or plain lasting, silks, and other stuffs.

SUSPENDERS, OR BRACES.

This is an article, the sale of which is divided among a great variety of kinds.

Vulcanized gum-elastic thread has recently been applied to numerous kinds of suspenders, which have heretofore been made of the native gum thread; as well as to other kinds that have recently been invented, such as the shirred suspender, and those made of vulcanized gum-elastic fabrics, felt, and other webs with elastic ends. This is one of those articles with which fashion has much to do, and the choice among the different kinds depends so much upon the fancy of the wearer, as well as upon the real utility of the article, that it may be considered presumptuous in any one to assert absolutely what kind is best. Among them all, the writer thinks the kinds most deserving particular notice, are those represented in plate xviii., figs. 1, 2, 3, 4, and 5. Figs. 1, 2 and 3 may be considered most complete and unobjectionable, among the most expensive kinds. The webs of these are firm and unyielding, which may be the most fanciful and expensive, or plain and substantial; in either case the most complete elasticity of the suspender is in a simple and cheap manner



obtained from the ends, both back and front, which are made of vulcanized gum-elastic cord, about one-fourth of an inch in diameter, braided over with sewing-silk, or the best cotton thread.

IMPROVED SUSPENDER.

Two other kinds of suspenders have been recently invented by the writer, which he supposes may, all things considered, be found cheapest and best for the greatest number, the first described is represented in plate xviii., by figs. 4 and 6. The webs are made of elastic vulcanized fabrics, with two or more button-holes cut in the back ends, and two or more gum-elastic buttons or studs attached upon the front ends. The object of this invention is to furnish a suspender without buckles. Suspender ends with buckles may be used with these, as with other suspenders, yet those made of elastic compound stayed goods, represented by figs. 6 and 7, are specially designed for them, and when used with studs, or gum-elastic buttons cemented on them, the suspenders are made without a stitch. The goods are printed in the piece; and when cut up and the buttons are attached, and the button-holes punched, the suspenders are finished. It may be objected that they cannot be taken up or let out so exactly as with the buckle. This objection is found to be unfounded on trial, the end being so very elastic that a slight difference in length is not observed by the wearer; besides, where the buttons or button-holes are placed at distances apart, especially if two or more button-holes are cut at the back end, the variations of length can be made as great, and with as little inconvenience, as with the buckle, where the means of lengthening and shortening exist only in front.

The other improved suspender alluded to is made of plated porous caoutchouc fabrics, printed in the piece. Strips of elastic compound, of from one to two inches in width, are cemented into the piece across it, at such distances apart as will give a

spring for each suspender. When this fabric is cut up longitudinally, in strips about two inches wide, one end of these strips being split about five inches, and the button-holes being punched, the suspenders are finished. See plate , fig. .

The other article of improved suspenders or braces is made of woolen felt, in the first stage of its manufacture into felt cloths, before it is sufficiently fulled for the ordinary kind of cloth, or while it is mid-way between the fleece, or bat of wool, and felt. In this state a sheet of gum-elastic is forced into the felt fleece, and while it is passing through the calenders, with the sheet of gum, the fibres of the wool are all drawn one way ; consequently, when cut up cross-wise, the felt admits of almost as great tension as the gum, and when cut up, the suspender which is made is evenly and pleasantly elastic the whole length of it, and is finished when the button-holes are cut, as represented figs. 8 and 9.

Before being cut up the goods are perforated. They are beautifully ornamented with the same facility as those before described.

SUSPENDER ENDS.

In the economy and comfort to be derived from gum-elastic suspenders, much depends upon the ends, which are now more than formerly made and put in the market a separate article from the suspender. And what is altogether in favor of these elastic ends is, that they can be attached to the cheapest, as well as to the most expensive and fanciful sorts. However cheap and unyielding the web may be, if only a list or piece of cloth, it will form a suspender sufficiently elastic, when the elastic end is attached ; and in case of damage or loss, the end can be replaced at a trifling expense.

The ends represented by figs. 10 and 11, plate xviii., are made of stayed compound ; 12 and 13 are made of perforated stayed compound. Those represented by figs. 15 and 16 are made of vulcan-

ized gum-elastic cord, braided over with silk or cotton, the same as those attached to the braces, figs. 1, 2, 3, and 4.

LADIES' ELASTICS.

This, like the gentlemen's suspenders, is also an article, the sale of which is divided among a great variety of kinds. The article represented, plate xviii., fig. 17, is made of various patterns and styles well known to the public. The kind now in common use consists of a ring of elastic compound, covered with silk or ribbon. They may be made by any person from the elastic bands that are sold at the shops, by fastening a ribbon around a bottle, or tumbler, or any other article, either round or square, of the right size, then place the elastic ring over this, and extend another ribbon over them both; stitch the two ribbons together on each side of the ring, and the elastic is complete.

IMPROVED ELASTICS.

Those which are represented in the plate, figs. 18 and 19, are called improved, on account of their durability, and the very small cost at which they may be produced, and because they may be made as fancifully as can be desired with little expense.

The article represented by fig. 2 is made of the same materials as the suspender described, plate xviii., figs. 8 and 9. The felt is perforated and printed in the piece. When cut up and the clasps attached, the elastics are finished.

Ladies' elastics are yet more cheaply made in another manner, and by many they are preferred to those with clasps, by cementing them in the form of an endless band, in which case the clasp is dispensed with, and they are put on by being slipped over the foot. See plate xviii., figs. 20 and 21.

STAYS, CORSETS, AND BRACES.

Since the invention of the shirred goods, and perforated stayed compound, they have been applied to stays, corsets, and braces, that were formerly in use, besides which they appear to have been the occasion of the invention of a great number of new articles in this line of manufacture. Without pretending to decide upon the particular merits of the different kinds, diagrams are given in plate xviii. of a few of them, the use of which most persons will no doubt understand without further descriptions.

PANTALOOON STRAPS.

These were formerly made, both in Europe and America, and were among the first appendages of wearing apparel that were made of the native gum-elastic. They were at first cut from the native gum over-shoe. The vulcanized article has been found much more durable and useful for this purpose; they are made after many devices, many of which are ingenious and deserving of notice on that account.

The common patterns are represented, plate xviii., figs. 22 and 23; button-holes being cut in number 21; 22 is stitched to the pantaloons.

HAT POCKETS

Are a recent invention among hatters, made by shirring the double lining of the hat, near the bottom, with an elastic ring, so that a convenient receptacle is formed for gloves, letters, &c. This appendage, of however doubtful utility, is more safe than carrying the same articles loose in the hat.

HAT COVERS

Are made of tissue, or corded tissue, and are designed as a substitute for the oil silk covers formerly used. When made with a cape as represented, plate xix., fig. , they answer the double purpose of a hat or cap cover, and a storm cape.

HAT AND CAP SPRINGS.

These are made of a gum-elastic cord or tape, either covered or not. Their use is to prevent the hat or cap from blowing off. See plate xix., Chapter XIX.

FOOT HOLDERS.

This is a recent invention,* intended to prevent persons slipping on the ice. It consists of a ring or band, elastic upon the top, and non-elastic in the part which comes underneath the foot. In the upper side of the under part, small pins are inserted to make it hold to the foot, and larger pins are inserted on the bottom to cause it to hold on the ice.

SHOE SPRINGS.

Gum-elastic shoe springs were first applied to shoes, and patented in the United States in 18 .† They were made by stitching cords of native gum between two cloths. Shirred goods were applied to this use as early as 1844. Subsequently, a license was disposed of by the writer to Mr. H. H. Day, and since that time shirred goods have been applied extensively to shoe springs.

* Doct. Charles Stearns, Springfield, Mass.

† Messrs. Dupont and Hyatt, New York.

IMPROVED SHOE SPRINGS.

These are made of napped or embossed stayed compound, perforated as represented in plate , fig. ; or they may be cut as needed, of any size or pattern, from the perforated knit goods, which are made very elastic one way, and non-elastic the other. These springs may be made to match the shoes with which they are worn, by napping in imitation of cloth, or embossing in imitation of any kind of leather. Their chief superiority over the shirred goods shoe springs, consists in cheapness and neatness, and beside, they do not sweat the foot.

There has been some objection made to the shirred spring, on account of its sweating the foot ; this objection does not apply to shoe springs made of perforated stayed goods, or perforated knit goods.

The importance of this small article, the shoe spring, is but just beginning to be appreciated by the public.

Whoever knows by experience the difficulty of teaching a family of children to keep their shoes tied, to say nothing of the neatness and convenience of the article for adults, will hail this as one of the *great* improvements of the age.

A set of these springs will outlast several pairs of shoes, and may be changed from the old to the new. Owing to their cheapness, utility, and durability, their use will probably become as general as that of any other article made of gum-elastic.

See plate , fig. .

VEST SPRINGS.

These have been made of shirred goods, and of different patterns, from elastic webs.

The pattern represented in plate , fig. , made of perforated stayed compound, with a buckle at each end, may be deemed worthy of notice on account of its cheapness and convenience.

GLOVE SPRING.

This is a very useful little article, made of braided gum-elastic cord. It had for some years been made in Europe, previously to the discovery of vulcanized gum-elastic.

CHAPTER XXVI.

WEARING APPAREL.*

Wearing apparel. Observations on water-proof wearing apparel. Coats and capes. Ponchos. Cape and hood. Leggings. Sleeves. Overalls. Cartmen's frocks. Storm collar and cape. Firemen's capes. Fording dresses. Full fording dresses. Baptizing dresses. Caps. Storm caps. Firemen's caps. Neck stocks. Aprons. Nurses' aprons. Washer-women's aprons. Brick-maker's aprons. Mechanics' aprons. Children's aprons. Dissecting aprons. Impervious gloves and mittens. Bathing and flesh gloves and mittens. Dissecting gloves. Boxing gloves. Pervious gloves and mittens. Shoes. Pervious overshoes. Congress shoes and gaiters. Buffalo shoes. Ladies' boots and gaiters. Men's boots and gaiters. Sporting boots. Jack boots. Moccasins. Invalids' shoes. Hotel and house slippers. Insoles. Shoe soles. Life-preserving apparel. Firemen's caps.

IN consequence of the recent invention of the perforated fabrics and their contemplated application to many kinds of wearing apparel, it is thought necessary to notice briefly some of the different articles of wearing apparel, under the separate heads of pervious and impervious articles, because the same articles, (although worn in the same way,) are in some cases worn for different purposes, and are often made of different fabrics.

It is obvious that the napped goods are best adapted to cold climates, and the perforated and porous fabrics only are suitable for pervious wearing apparel. Plated fabrics of cotton, linen, and woolen, as well as the fibrous fabrics, vellum, tissue, and felt, either plain, napped, or embossed, and also drapery, are used respectively as materials for water-proof wearing apparel, according to the strength required for the garment, the climate in which it is worn, or the fancy of the wearer. In the following chapter, the various articles are described as made of the different fabrics, in accordance with past experience, and the best judgment that can now be formed of the adaptation of these fabrics.

* A license for wearing apparel had been disposed of to the Union India Rubber Company for the United States, and the business is carried on extensively by them, both at Naugatuck, Conn., and at Harlem, N. Y.

OBSERVATIONS ON WATER-PROOF WEARING APPAREL.

Articles of water-proof gum-elastic wearing apparel are liable to one serious objection, which is, that it confines perspiration; therefore articles of water-proof wearing apparel are only suited to certain occupations, or special occasions, and should always be used with caution.

It is unreasonable to expect a thing to be, at the same time, both pervious and impervious to air and water. The shoe, or garment, being water and air-tight, confines the perspiration of course, and this is not caused by any peculiar property of gum-elastic. Articles of this kind are not intended, and are not suitable to be worn constantly. To use them in this manner would be dangerous to health. Yet, when worn to avoid exposure to rain and snow, they are found invaluable. When intended as a protection against cold, they should be either napped, lined, or worn over other garments. A simple gum-elastic glove worn next the hand will make it cold, but worn loosely over another light glove will be very comfortable. With the laboring classes it is becoming quite common to wear, instead of a leather shoe, what is called the buskin or lined gum-elastic shoes for economy as well as comfort. This is certainly better than to wear leaky or bad leather shoes; but it would be better to avoid wearing them, if possible, in the house. Those who will do so, should have two pairs, which, in the end, will be no more expensive, and changing them will give time for the lining, which has been charged with perspiration, to become dry. With regard to suspenders, elastics, military stocks, or even a vest pattern, or any article that does not come in contact with the person, the idea that prevails with some persons, that they cause perspiration, or are uncomfortably warm, is chiefly imaginary. A military hat or cap is no more objectionable on this account than any other hat or cap, which is made water and air-tight with other gums in the usual manner. In other words, there is no

inherent quality in the gum to cause perspiration more than in other kinds of gum, or more than in fabrics made water-proof with oil. It not unfrequently happens that the purchaser of a coat will return with it, protesting that it leaks, after having labored hard with it, on, in moderate weather. The same thing happens with sportsmen in regard to the boots of this manufacture; nor can they be convinced, until, upon filling them with water, they become satisfied that water cannot get out, and, therefore, that it cannot get in. As it sometimes happens, the article may leak from being badly manufactured, or from its being damaged; the above is therefore always a proper test for ascertaining the facts in the case.

The foregoing remarks apply to water-proof gum-elastic wearing apparel only. Gum-elastic has heretofore been valued for wearing apparel, chiefly, on account of its water-proof quality. It has been taken for granted that no improvement could be made in ordinary wearing apparel with it, and that none was desirable; but whoever considers the expense of time, labor, and money requisite for persons, especially for the laboring classes, to be at all times neatly and comfortably clad, must admit that if any new material could be substituted, which combines durability and neatness with facility of being cleansed, it would add greatly to the comfort and welfare of mankind. It is confidently believed that this desirable object will be attained by the use of the porous and napped gum-elastic fabrics for ordinary wearing apparel.

COATS AND CAPES

These are made of coated cloths or felt. They are made the most completely water-proof at the factories of the licensees,* but they are sometimes made up with the needle from the fabrics obtained in the market, and are made nearly or quite water-proof, when welted in the manner described, page . The

* Union Company, both at Harlem, New York, and at Naugatuck, Conn.

articles of this sort, heretofore made of coated cloths at the factories, are so well known throughout the United States, that a particular description or recommendation of them is unnecessary.

It may here be remarked, as has been done elsewhere, that they should not be worn to exercise much in; and they are most valuable to those persons, such as coachmen, sailors, and teamsters, who have occasion to sit or stand when exposed to storms, or who travel in severely cold weather.

PONCHOS

Are cut after the Spanish pattern, which is so much worn in Mexico, and other countries where the method of travelling is mostly on horseback. The Spanish poncho is generally made of heavy woolen stuffs, an opening being cut in the middle for putting it on, over the head.

The articles here described are made of corded and napped gum-elastic, vellum, plated and napped cloths, or felt, of the above pattern, which is simply an oblong piece of the goods about two yards and a half long, by two yards in breadth. They are a better article than the woolen poncho to sleep on upon the ground, but not so good to sleep under, on account of confining perspiration. (It is believed that this difficulty will be obviated as relates to ponchos, as well as numerous other gum-elastic articles by the manufacture and introduction of the porous fabrics.) They are sometimes made with a pillow in one corner of the blanket, to be inflated at pleasure, as represented plate xix., fig. 1. They are more convenient for riding on horseback than any other form of garment, because the rider has the free use of his arms. They are a better protection from rain than any other, because they can be thrown over the saddle and over the equipments, both before and behind the saddle, and will carry the water off; whereas, in the case of a coat or cape, the water is only carried directly under the seat. When worn with the sleeves and leggins, rep-

resented in plate xix., figs. 2 and 3 ; and the cap, represented in plate xix., fig. 4 ; and especially, if the muffler, fig. 5, is added, the rider is most completely equipped and defended against the storm, whether of rain, sleet, or snow ; but unless the latter are to be encountered, the muffler is superfluous, as it is too warm to be commonly worn in a warm climate.

The poncho with sleeves, made of vellum, is also a cheap and good protection for milkmen and milkmaids, when engaged in their occupation, or for persons travelling, when exposed to storms.

CAPE AND HOOD.

This article is made of porous vellum, corded vellum, and tissue, or plated cloths for warm climates, and of those which are napped for cold climates.

The hood is a complete appendage for a water-proof garment, and is as well adapted for walking and driving in the rain, as the poncho is for riding on horseback. This form of garment is a very useful one for ladies', as well as for gentlemen's wear.

LEGGINS.

The short leggins, represented in plate xix., by figs. 6 and 7, are best made of vellum, and are used for walking, or riding on horseback, in muddy travelling. The long leggins are represented by figs. 6 and 7. Fig. 6 is fastened by being shirred or corrugated, with an elastic band at the top. Fig. 7 is sometimes shirred, and sometimes secured by a strap around the waist. Fig. 8 is a long leggin, sometimes made of vellum, shirred the whole length by a number of elastic bands, for the same use as figs. 6 and 7 ; but it is more commonly made of flannel, which is not coated with gum-elastic, and shirred with elastic bands, by means of the needle. This article is designed only to be worn

in the cold and snow, for which purpose it cannot be too highly recommended, as most comfortable and convenient.

SLEEVES.

The long sleeve represented in plate xix., fig. 9, is made of napped and corded vellum, or plated fabrics, and is designed to be worn with the poncho, as described on page . The short sleeve, represented by fig. 10, is made of perforated vellum, or drapery, and is intended to be worn by misses, as a substitute for that which has sometimes been made of morocco, or other material, as a protection for the dress.

OVERALLS.

Gum-elastic corded vellum or plated cloth is best suited for this article, they answer a good purpose for sailors standing on watch, or for the driver, in stormy weather; but they are too warm to be worn much by persons while laboring. In the former case they are undoubtedly conducive to health, but for ordinary wear they should be avoided.

CARTMEN'S FROCKS

Have hitherto been made of coated cloths, after the pattern represented in plate xix., fig. 11. But they have commonly been found too warm. It is a desirable pattern of garment for coachmen as well as cartmen, answering better to wear without leggins than other patterns of coats, although other patterns are usually preferred when worn with leggins. It is believed that when made of porous fabrics it will be found sufficiently waterproof to protect the wearer from wet, and at the same time not too warm.

STORM COLLAR AND CAPE.

This is made of napped drapery or vellum, as represented in plate , figs. 12, 13 and 14. This article, being napped with cotton or wool on the inside, will be found comfortable in a cold storm, affording the neck a complete protection from the rain or snow, a comfort which it is otherwise very difficult to obtain ; for, as most travellers know, it is no easy thing to keep out a driving storm by any ordinary apparel. Fig. 12 represents the article as used for a cape or muffler. In fig. 13 the collar is drawn up by the lacing to be used as a cap, and is readily shaped by pressing down the top, as in fig. 14, into a travelling cap.

FIREMEN'S CAPES

Are made of corded vellum, plated cloths, or gum-elastic felt. The fabrics are well adapted for this use on account of their water-proof quality, and also for another reason. Although the vulcanized fabrics burn fiercely when ignited, they do not catch fire so readily as most other fabrics. These capes may be made more comfortable by being made of porous fabrics except the parts about the shoulders ; they will then be sufficiently water-proof to protect the wearer from wet.

FORDING DRESSES

Are made of plated cloths, or corded vellum, being in the form of pantaloons with boots attached, and a large tube surrounding the top, which is inflated with air. They are used for fording rivers, and by the aid of a cord to pull the dress back across the stream, a party of any number may cross a river with one dress. See plate , fig. .

FULL FORDING DRESS.

This is a similar article to that described, plate , fig. differing from it only in the upper part by the addition of sleeves, gloves, &c., so as to cover the whole person. Being drawn closely about the neck, a man may ford a stream without removing his garments.

While wearing under the sheet of water at Niagara Falls one of the open, uncouth over dresses of oil cloth, that are afforded visitors at Niagara, at the price of half a crown, the writer imagined that the public might be better accommodated with a dress, such as the one here described, represented by fig. , plate .

BAPTIZING DRESSES.

These are made of plated cloths or corded vellum. They have been found useful, and have been highly approved of by Baptist clergymen, who are obliged to stand a long time in water in cold weather. They are made similar to fishing pants, except that they are cut higher in the waist.

The full fording dress, described on page , either with or without the life-preserver, is also well adapted to this use.

CAPS

Are made either at the factories or with the needle, as caps of other materials are made. Gum-elastic, vellum, and felt, and also the same fabrics when napped and perforated, or embossed in imitation of morocco, are suitable for caps, according to the climate and service for which they are intended.

A suggestion may here be made as to the advantage of making

these as well as other kinds of caps and hats, partly of pervious, and, in part, of the water-proof fabrics, by which they may be made cool and yet water-proof. See plate fig. .

STORM CAPS.

In general, storm caps are made of the same materials as those already described, with the addition of a storm cape, made of corded tissue or vellum for warm climates, and of corded napped tissue, vellum, or plated fabrics, for cold climates.

This cap and cape cannot be too highly recommended to be worn in stormy weather, or when riding with the neck exposed to a draft of air. The cape, when not needed, is turned inside the cap.

FIREMEN'S CAPS

Are made, both with and without capes, as represented, plate xix., figs. 15 and 16. Bands of iron pass transversely over and around the top of the cap. The use of these is to protect the head from falling timbers. The materials of which these caps are made, as well as the method of their manufacture, are much the same as those used for military caps. For a more particular description of which, see Chapter X.

NECK STOCKS.

These are made of perforated felt or non-elastic compound. They are vulcanized and shaped upon forms, so that they will ever after retain their exact shape. They are afterward lined with the needle with any suitable material. For soldiers, or persons who are exposed to storms, it is believed they will form a very useful covering for the neck.

APRONS.

A great variety of aprons are made of the different fabrics, which answer very useful purposes.

In the early manufacture of gum-elastic in the United States, this branch of business, particularly that of ladies' and nurses' aprons, was carried on very extensively, and large quantities of them were made and sold by the Roxbury, as well as other India Rubber companies; so that for one or two years the operations of a number of extensive manufacturers were almost wholly confined to this article. Unfortunately for the manufacturers as well as the public, the aprons that were then made, were almost or quite valueless, and the disappointment was such, that since that time aprons have not been manufactured and put in the market as articles of merchandise, although India rubber piece goods are cut and worn for that purpose. There is little question but when the manufacture is again attempted, and ladies' aprons are made from the fibrous, and porous fibrous fabrics, they will be found as economical and useful as ever was anticipated.

NURSES' APRONS

Are made of plated fabrics and corded vellum, or tissue.

WASHERWOMEN'S APRONS

Are made of plated cloths and corded vellum.

BRICKMAKERS' APRONS

Are made of heavy porous fabrics, or vegetable leather, perforated.

MECHANICS' APRONS

Are made of perforated felt or vegetable leather; when made of the water-proof fabrics they have been found too warm.

CHILDRENS' APRONS.

Corded tissue and vellum, plated muslin, and perforated vellum, are in general best suited for infants' bibs and childrens' aprons.

DISSECTING APRONS

Are made of corded perforated vellum, or plated fabrics, with sleeves and gloves attached. See Chapter VII., Medical and Surgical.

IMPERVIOUS GLOVES AND MITTENS

Are made most commonly of knit goods and napped elastic compound. When made of elastic compound they are constructed in a peculiar manner, with non-elastic stays upon the seams, in order that they may be conveniently drawn upon the hand. They are designed to be worn over other gloves and mittens, and to be used in various departments of labor and occupations, where those engaged in them are obliged to have their hands in liquids that are injurious. Hatters, chemists, dyers, and numerous other tradesmen, who have to make use of strong acids and alkalies, will find them useful. For housewives and servants, who handle coal and ice, and for washing, especially when the hands are dipped alternately in hot and cold water, or when they are chapped, they will be found very valuable.

When these articles are worn over other gloves they are not only comfortable and warm, but they are a great protection to other gloves, keeping them from being injured by wet. They are not intended to be worn next the hand, except in cases where it is inconvenient to wear an under glove. Fine light gloves and mittens of gum-elastic tissue and drapery, are also much approved for bleaching ladies' hands, and healing those that are chapped.

BATHING AND FLESH GLOVES AND MITTENS.

See Chapter XIII, Bathing Apparatus.

DISSECTING GLOVES.

See Chapter , Medical and Surgical.

BOXING GLOVES.

See Chapter , Sporting.

PERVIOUS GLOVES AND MITTENS.

Specimens of this article have recently been made from perforated felt and perforated elastic compound, which give assurance, that ere long, gloves and mittens will be made for ordinary wear, which will answer well as substitutes for gloves and mittens made of buckskin, kid, wool, and other stuffs; and that the heavier kinds, at least, will be made pervious to air and impervious to water.

SHOES.

About thirty years since, the first few pairs of native gum-elastic shoes, or what might more properly be called India rubber bottles, with openings in the sides, were imported into Boston.

At that time their uncouth and clumsy shapes, added to their weight, was a great hinderance to their introduction; notwithstanding which, their importation continued to increase, as they were gradually improved, until 1840, previous to which time more than half a million pairs were imported in one year.

The first vulcanized gum-elastic shoe was made by the inventor in 1840, but owing to the difficulty of operating the heating process at that time, and the embarrassments of the writer, this manufacture was not fairly started until 1843, or much noticed in any way until 1844.

In 1845, a successful shoe manufacture was put in operation at Hamden, Connecticut,* and another at Naugatuck.† As the manufacture of these shoes was improved, they came rapidly into favor with the public, and the demand has increased, so that, at the present time, fifteen thousand pairs per day are manufactured by the licensees of the inventor.

For several years past the increase of this manufacture has more than doubled each year, which will probably be the lowest estimate which can be made of the increase of the manufacture for some years to come; since, in addition to the real utility and durability of these goods, the manufacturers have attained a perfection of finish, and a style of execution, which is hardly surpassed in any branch of manufacture, either in this or any other country; and the demand for them is not only becoming general throughout the United States, but they are being exported largely to England, and are also being introduced into many other foreign countries. They have become so common in the United States, and their qualities are so well known, that any remarks

* By Mr. L. Candee.

† By Mr. William DeForest.

concerning them are, perhaps, unnecessary. They are, to many persons, an article of absolute necessity ; and their great economy is a great temptation, especially for the laboring classes, to wear them constantly. Some persons may do this with impunity, especially if they are changed often ; but in general, on account of their confining perspiration, they may be considered injurious to health, if worn constantly. They are only suitable to be worn out of doors in wet or muddy walking. The foregoing remarks are applicable to this branch of manufacture as it has been, and as it now exists ; but in consequence of the improvements which are made in the fabrics by perforating or making them porous, it is presumed that gum-elastic shoes will, ere long, be made, which may be worn constantly, with even more satisfaction than leather shoes. Specimens of perforated and porous gun-elastic shoes have recently been made, that warrant the conclusion that the gum, with the high finish that is given to these shoes, is so far a repellent of water, that, when they are of an ordinary thickness, water will not penetrate them, unless under pressure ; and it is certain that they are equally comfortable, or more so, than shoes made of cloth or leather, so far as relates to the upper portions of them.

The soles, when made of India rubber, cemented in the usual way, will, in some degree, cause the soles of the feet to perspire. This may be obviated in a great measure by an inner sole of another material, and completely removed by cementing a stay around the edge of the upper, and stitching a leather sole to it, in the same way as leather shoes. By these means it is expected that gum-elastic will answer not only the present use for over-shoes, but that it may be made a porous vegetable leather ; and so far, at least, as shoes are concerned, a substitute for animal leather for ordinary wear.

If the writer is correct in these conclusions, the future usefulness and extent of this branch of gum-elastic manufacture can hardly, at the present day, be estimated. The saving of expense certainly cannot, at present, be estimated. Even now, the cost of shoes of gum-elastic or vegetable leather, is much less than



those made of animal leather ; and the expense of manufacturing some kinds, when the shoes or boots are cemented, is as ten to one in favor of gum-elastic, so that when the channels of supply are fairly opened for obtaining the raw material in the abundance in which nature yields it, what is anticipated now can hardly fail to be realized.

Among the numerous kinds of gum-elastic boots and shoes that are being made, the following may be noticed, most of them because of some peculiarity in their construction, on which account diagrams of some of them are given.

PERVIOUS OVER-SHOES.

The public have become so well acquainted with the impervious vulcanized over-shoes, that any description of the various styles, or comments upon them, more than have before been made, may be superfluous. The perforated over-shoes, which are here alluded to, are made whole, and without perforations, like other over-shoes, for *about half an inch* up the sides, the other parts of the upper being perforated, as represented plate xx., fig. 1.

CONGRESS SHOES AND GAITERS.

This is a term which has been applied to boots and shoes of various kinds, which have the gussets or springs inserted, which are described, page

These might, with more propriety, have been called the people's boots and shoes, for the reason that, in all probability, they will go into general use among all classes. While the article was made with the springs of shirred goods, they were much approved, notwithstanding these springs were too close for hot weather. Since the introduction of the perforated spring, no objection exists to this improvement. It is found to answer the

purpose of fastening gaiters and shoes so much better than any shoe-string, clasp, or lacing, that has heretofore been used, that no comparison can fairly be made between the old and new method of fastening shoes on the feet. See plate xx., fig. 2.

BUFFALO SHOES.

Shoes made of buffalo hides, with the fur inside, have been very much worn in the northern and western states, where furs are abundant, and where an article of this kind is needed on account of the coldness of the climate; but they are oftentimes uncomfortably warm, and do not answer in snow-water or wet weather. When these shoes are made of buffalo hides, covered with gum-elastic, they are much more durable and comfortable if the upper parts of the shoe are perforated, so as to be pervious to air and impervious to water, as represented, plate xx., fig. 3.

LADIES' BOOTS AND GAITERS.

The upper part of these are made of porous fabrics, or felt loosely cut. No article of the shoe kind is more useful than this for ladies and children to wear in the snow, or in muddy walking, or when dew is on the grass. As a preservative of health they are invaluable. See plate xxi., figs. 4 and 5.

MEN'S BOOTS AND GAITERS.

Vulcanized gum-elastic boots have commonly been made upon a knit fabric; gum-elastic felt is also a suitable material for this purpose, when the tops are perforated, as represented by figs. 6 and 7. They are comfortable to be worn at all times. They are made of both the above materials, without perforating, for wear-

ing in water. Another article has been made to considerable extent, by covering a woollen felt boot, formed whole, like a hat body, with a sheet of elastic compound upon the outside. These boots have been highly approved, to be worn occasionally for a day in severe cold or stormy weather, as, in so short a time, the felt does not saturate with perspiration, so as to make them uncomfortable. When thus worn, or for standing, or wading in water or snow-water in cold climates, they are unquestionably more comfortable than any other boot; but it is the height of imprudence to wear them constantly for days in succession.

SPORTING BOOTS.

These are made of the same materials as the gum-elastic boots before described; the tops are made either of felt or plated cloth. They are fastened by a belt around the waist, and worn for wading in water, or for marsh shooting, being made high, as represented in plate xxi., fig. 8.

They do not always answer the expectation of the wearer, being too warm for active exercise. They are as uncomfortable for the feet, when wet with perspiration, as when wet with water. They may be worn with great satisfaction by any one standing in water, or wading in marshy ground, either for fishing or shooting, when the wearer does not exercise so as to perspire freely.

JACK BOOTS.

This article, which has heretofore been made of hard leather, may be advantageously made of perforated felt, or vegetable leather. See plate xxi., fig. 9.

MOCCASINS.

It is well known that the buckskin moccasin, which is so much prized for wearing in cold weather, is much injured by being wet. They may be much improved by being covered on the bottom and sides with elastic compound. See plate xxi., fig. 10.

INVALIDS' SHOES

Are manufactured of perforated gum-elastic felt, and porous elastic knit goods, with an insole of perforated sponge fabric, as represented in plate xxi., fig. 11. Besides answering the common purpose of a leather shoe, this article will be found most comfortable for those who are afflicted with lameness, especially when the soles are made of gum-elastic sponge.

HOTEL AND HOUSE SLIPPERS.

These are made from the perforated gum-elastic fabrics, with leather soles, by stitching like other shoes. These slippers are not only pleasant and comfortable in-doors, but they may also be worn out of doors, or in the wet, with impunity. Numerous other kinds of perforated shoes for ordinary wear, as a substitute for shoes of cloth and animal leather, might be noticed with equal propriety; but it is presumed that their advantages will be sufficiently obvious from the descriptions already given, and the diagrams, plate xxi., fig. 12.

INSOLES.

Insoles for leather shoes may be formed of sheets of perforated gum-elastic sponge, as represented in plate xxi., fig. 13, which are so very soft, elastic, and pleasant to the feet. For the lame, were it not for the objection of sweating, these articles might be highly recommended. The objections are, in part, removed by perforating, and afterwards covering them with flannel or other woven cloths.

SHOE SOLES.

Within a few years past a method has been adopted in some parts of the United States, of cementing an outer sole of vulcanized elastic compound upon leather boots and shoes, both when they are new, and after the leather soles are worn off.

These articles have given entire satisfaction to the wearer, both on account of their economy, in causing them to wear much longer than they otherwise would, and because they answer, in part, the purposes of an India rubber shoe in keeping the feet dry without causing them to perspire.

An article of this kind has been recently invented,* which can be conveniently put on and off, as represented in plate xxi., fig. 14. The strap of this sole is made of elastic compound. Although it is as yet quite new and untried, it may be considered a real improvement, and another acquisition for the comfortable protection of the feet. See plate .†

LIFE-PRESERVING APPAREL.

A number of these articles are represented, plate xxi. The fabrics from which they are manufactured, viz., the air-work and

* By Doct. Charles Stearns, Springfield, Mass.

† Since introduced, and found highly useful.

the quilted fabrics, are described, Vol. I., Chap. X. The uses to which they may be applied, and their utility as life-preservers, are alluded to in the description of one of them, fig. 4, as a poncho, or cape bed, in Chapter . The style of work is durable, and, arranged as there described, is perfectly safe as a life-preserver, and also useful as a mattress, bed, or cushion; but considering its bulk, how far it may be applied or made practically useful for garments, in comparison with other things that are lighter and more convenient as garments, is a question.

FIREMEN'S CAPS

Are manufactured by the combination of caoutchouc whale-bone and vegetable leather, much in the same manner as the military caps, described in Chapter . This cap is made so as to unite all the properties that are desired in firemen's caps, being so constructed as to ward off accidents, without being too heavy or unyielding. See plate , fig.

CHAPTER XXVII.

BATHING APPARATUS.

Bath tubs. Portable bath tubs. Child's bath tub. Foot baths. Portable foot baths. Bathing mats. Bathing and flesh gloves. Bathing and flesh mittens. Bathing pantaloons. Shower baths. Hand shower baths. Sponge bags. Bath tub straps. Bathing caps.

IN this hydropathic age, when the public mind is awake to every thing that relates to bathing, labored argument is not necessary to prove that gum-elastic is useful for such purposes; and it is presumed that a brief description of the various articles of this kind that have been made of it, together with the drawings in the plate, are all that is required to give the reader a correct idea of their adaptations.

BATH TUBS.

Stationary tubs are made of caoutchouc board or whalebone, on account of cheapness, and for the purpose of giving medicated acid baths, as the gum is not injured by acids, like metal or wood.

PORTABLE BATH TUBS.

These may be, and have been constructed in various ways, among which two kinds have been selected for description, which appear best adapted for this use, as represented in the diagrams, plate , figs. 1 and 2.

Fig. 1 represents the article made of corded and barred plated fabrics, constructed of the common form of bath tubs, of any size required, with a strong hose about three inches in diameter, of the same material, running upon each side, the length of the tub, through which bars may be slipped to support it.

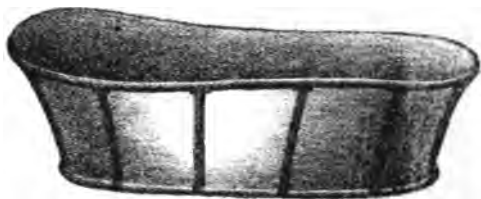
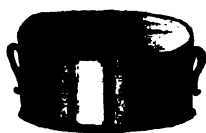
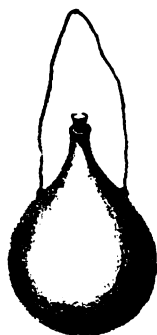
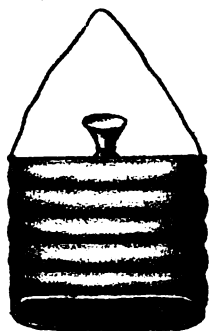
Fig. 2 is another form of bath tub, which is made with a wooden or iron hoop around the top, and movable bars or supports, which are hinged at the bottom with elastic compound, which gives way enough to allow the supports to be slipped into sockets at the top of the tub, or they may have non-elastic hinges at the bottom, and be otherwise hinged or fastened at the top. Either of these kinds, when not in use, occupy a very small space, which is often a great consideration for camp and for ship's use.

CHILD'S BATH TUB.

The bathing mat, with a large tube, is sometimes used as a child's bath tub. The tub may also be made by nailing a square piece of plated canvas upon a frame or horse, in the manner represented in the plate , fig. , or they may be made of a small size, in the same way as the portable bath tubs already described.

FOOT BATHS

Are made of gum-elastic whalebone board, as represented in plate, figs. 1 and 2. They have an advantage over earthen or metal baths on account of their lightness, and are not liable to be broken or bent.



PORTABLE FOOT BATHS.

These are made of strong plated canvas, as represented in the plate, figs. 6 and 7, with the rims and braces arranged in the same manner as in the portable bath tubs already described, and they may, like them, be packed in a small compass for transportation.

BATHING MATS.

These are made of gum-elastic vellum, plated cloth, or plated muslin, from three to six feet square ; and are also made round, from three to five feet in diameter, as represented in plate , figs. 8, 9 and 10. The cheapest article of the kind, fig. 8, is made with a cord of elastic sponge or cotton rope, cemented in around the edge, to prevent the water from running off the mat when in use. Figs. 9 and 10 represent an improved bathing mat, made with a border inflated with air around the edge, instead of the cord as above described. This border is inflated with the self-acting valve tube, described page . The advantage gained by this improvement is this, when the border is collapsed it is much the most portable, and it therefore admits of a much larger border being used, than can be obtained with the cheaper article made with a cord. Both these articles will be found very useful in families for bathing. They are also a great convenience and comfort for the same purpose to persons travelling, particularly when the hand shower bath is used. When the tubes are made large enough, or when one is placed above another, as represented by fig. 11, they may be made to answer all the purposes of the bath tub, especially for children.

BATHING AND FLESH GLOVES.

These are made of knit goods or elastic compound, with a sheet of elastic tufted sponge cemented to the face of the glove. They answer the common purposes of a flesh brush, and are made superior to bristle brushes for bathing, as they are not softened by being saturated with water. See plate , fig. 12.

BATHING AND FLESH MITTENS.

This article is very similar to the glove above described, except that it answers the purpose of a clothes brush as well as other uses, better than the glove, and they are somewhat differently made; the inner part of the mitten being made of a sheet of the sponge, instead of being lined or veneered with it like the glove. See plate , fig. 13.

BATHING PANTALOONS.

These are made of vellum or plated fabrics. They are evidently better adapted for the purpose of bathing than the clothes which are commonly used at watering-places and at public bath houses, and are the more convenient for being gathered at the top and bottom, being shirred with an elastic cord. See plate , fig. 14.

SHOWER BATHS.

The curtains of a variety of shower baths, both portable and stationary, may be made of gum-elastic tissue and vellum, among which may be noticed those represented by figs. 21, 22, and

23. These fabrics may be recommended for this use on account of their cheapness and water-proof quality.

HAND SHOWER BATH.

This is a convenient article, both for families and for travellers, and is designed to be used generally with the bathing mat. It is made of gum-elastic vellum or elastic compound, distended by a series of hoops, diminishing in size one above the other, so that when collapsed, it shuts in a very small space, and is quite portable.

The article is filled with water by suction, through the sieve at the bottom, which is made of perforated caoutchouc whalebone or whalebone board. See plate , fig. 17.

SPONGE BAGS.

These are made of vellum, tissue, and drapery. They are much cheaper, if not far preferable, to those made of oil silk. They are the more convenient on account of the mouth being closed by being shirred with an elastic cord, and may be recommended as a useful article to travellers, for carrying sponges.

BATH TUB STRAPS.

This is a strap of elastic compound stayed goods, and though a small article, may be recommended as a substitute for the cloth strap or webbing, heretofore used at the head of bath tubs, on account of its cleanliness, elasticity, and water-proof quality.

BATHING CAPS

Are made of drapery or tissue. These fabrics are very suitable, and highly approved of for this purpose; the drapery, on account of its elasticity, and both on account of their waterproof quality and cheapness. They are shirred around the edge with an elastic cord. See plate , figs. 15 and 16.

CHAPTER XXVIII.

TRAVELLING APPARATUS.

Umbrellas and parasols. Trunks. Paper trunks. Hat boxes. Muff boxes. Valises. Band-boxes. Travelling bags. Improved travelling bags. Incompressible bags. Portmanteaus. Saddle-bags. Mail-bags. Horse mail-bags. Bottles. Hot-water bottles. Improved hot-water bottles. Shaving boxes. Dressing boxes. Portable desks. Pocket instands. Expansion trunks and valises.

THE advantages to be derived from the use of gum-elastic for travelling apparatus are so obvious, that it may be emphatically said, this is one of its most appropriate uses.

The fabrics are not only suitable substitutes for other materials in the manufacture of many kinds of travelling apparatus, which have been in common use, but they have also given rise to improvements in their construction, and many things have been invented from them, which add to the convenience and comfort of travelling, and what is of more consequence, to the safety both of person and property. Descriptions of an assortment of these inventions will be found in this and the following chapter.

UMBRELLAS AND PARASOLS.

See Chapter .

TRUNKS.

Common wooden trunks may be rendered water-proof by covering them with gum-elastic materials, of different kinds, and a further improvement may be suggested in the use of a fabric, with gum-elastic nails or studs of non-elastic compound or packing. In either case, short wood screws may be inserted through the studs into the wood part of the trunk. This will obviate, in a great measure, the common liability of trunks to chafe and damage. This method is certainly preferable to the common one of loading trunks with heavy metal nails, which give little more than a *show* of strength and protection to the trunk, while at the same time they serve to damage every thing else with which they come in contact.

PAPER TRUNKS.

The improvements which have, of late years, been made in the manufacture of pasteboard, have rendered it suitable for many substantial uses. It is, in many cases, equally or more substantial than wood when protected from dampness. Its being liable to be damaged by water, and being so difficult to nail or fasten together by any means heretofore known, has undoubtedly prevented its being used for a great variety of purposes for which it might otherwise be suitable.

A plan is adopted in the manufacture of these trunks, which might be applied to other things made of pasteboard. They are cemented together with gum-elastic bindings, and afterwards covered with the gum-elastic fabric, being strengthened with bands and braces of tin, sheet-iron, or other suitable supports covered with the same material.

It is believed that trunks of this description will be found more durable than those which have commonly been made of wood.

HAT BOXES.

Common pasteboard hat boxes are made water-proof and very durable, when constructed upon the plan of the paper trunks, before described.

MUFF BOXES.

See Chapter VII.

VALISES.

The same improvements that have been suggested for band-boxes and trunks are applicable to valises, when they are made either of wood or of pasteboard.

BAND-BOXES.

The common pasteboard box is much improved and rendered durable by covering with gum-elastic tissue or vellum. These fabrics may be put on in the usual way with glue or flour paste. The paste being protected from dampness by the coating of gum, it is not necessary to use a more expensive cement. If they are strengthened by a hoop of rattan or tin, covered with the fabric, and placed around the edge of the lid, and also around the rim of the box, as represented, plate , fig. , they are rendered much more durable. Paper boxes, constructed in this way, have been found to last for years. They may be exposed outside in travelling like trunks, and do not require that extraordinary care of being carried inside the vehicle, which has always made paper boxes so annoying to travellers.

The first cost of boxes made in the way here described, is something more than that of paper boxes in common use, but in

the end they will be far the cheapest, to say nothing of what is gained in safety.

TRAVELLING BAGS.

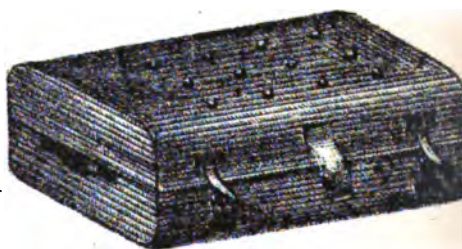
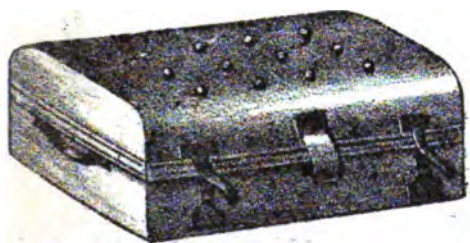
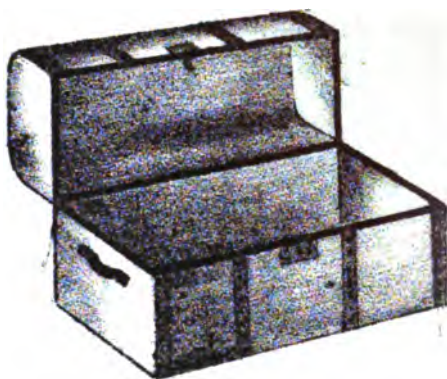
Numerous kinds of these are manufactured of different gum-elastic fabrics. The plated fabrics may be recommended as most suitable in general for the common kinds. They may be made up with the needle, and secured by different kinds of fastenings, like other bags. That represented by plate , fig. , has an apron or mouth attached to the top, which may be dropped within the bag or used out of it, so as to increase the size very much.

IMPROVED TRAVELLING BAGS.

This bag is made of gum-elastic materials, and differs from other kinds only in the method of fastening it. It is closed by a slide made either of gum-elastic whalebone or metal. This slide is simply a plain hollow tube, either round or square, with a handle in the middle, and a cut the whole length, into which the mouth of the bag is slipped. This tube is equally well adapted for traveling bags made of other materials besides gum-elastic; it will be found one of the most simple and convenient fastenings, and may be made quite secure by a padlock at the end. See plate , figs.

INCOMPRESSIBLE BAGS.

The incompressible bag, which is designed to pack in the smallest compass when collapsed, is made of gum-elastic plated fabrics, as represented by plate , fig. . They are inflated by means of the valve tube described on page , and their inflation prevents their contents being damaged by pressure. They are well adapted to carry light articles, such as



caps, ruffles, &c. ; also for a life-preserver, being made quite impervious to air and water.

The same form of bag, when made of heavier materials and vulcanized upon a block or last, will keep its shape so as not to require inflating with the tube.

A convenient form of incompressible bag is made as represented by fig. , having the body of a trunk or box united with the upper part or mouth of a bag. A similar article is made with a box which shuts or folds like an accordion. See plate , fig. .

PORTMANTEAUS.

Portmanteaus are manufactured of perforated gum-elastic fabrics, in combination with those which are not perforated, as represented by plate , fig. .

SADDLE BAGS.

These are manufactured of the same material as the portmanteaus, and may be recommended on account of their water-proof qualities and safety in fording rivers, particularly when they are made water-tight at the mouth. See plate , fig. .

MAIL-BAGS.

If there is any one purpose for which it is desirable to substitute gum-elastic for leather, on account of its water-proof quality, it is for mail-bags. The value of their contents, and their exposure to damage and loss by water, being generally known and often commented upon, led many persons, at a very early period, to suggest to the writer that this would be a useful application of gum-elastic.

On these accounts the first premature attempts to make mail-bags, were made before the vulcanizing process was at all understood or rendered practicable to any extent.

The unsuccessful attempt by the inventor to manufacture mail-bags of gum-elastic, previous to the discovery of the vulcanizing process, has been noticed in the first volume of this work; this was followed by another premature attempt of the licensees to make them of vulcanized coated canvas. These, although answering a tolerable purpose, did not give satisfaction, owing to the weight of the article, and the gum peeling from the canvas. This last obstacle to the use of these fabrics as a substitute for leather, has frequently been remarked upon, and also the manner in which the difficulty is removed by the invention of the fibrous fabrics, felt and vegetable leather. Since the invention of these fabrics, specimens of mail-bags have been made, which, in the judgment of those who have seen them, cannot fail to answer the purpose for which they are made. They are constructed of corded and barred fibrous and plated fabrics, fastened in the usual way with the chain, or with jaws, like the ships' letter bags. See Chapter , fig.

HORSE MAIL-BAGS.

Horse mail-bags are used for conveying mails on horseback, in parts of the country where it is impossible or difficult to convey them in coaches or wagons. They are, therefore, more exposed than other mail-bags to be lost or injured by water in fording rivers. A gum-elastic bag of this sort has been constructed of gum-elastic fabrics, in the form of the common portmanteau; and when the mouth is closed with a water and air-proof fastening, as represented plate , fig. , they may be made to answer the purposes of a life-preserver, both for the horse and rider, in fording rivers.

BOTTLES.

Several kinds of gum-elastic and covered bottles have been noticed under their respective heads, Chapters

Recent improvements, by which the vulcanized fabrics are made more pure and free from odor, render this use of gum-elastic more deserving of special notice. The insertion of the bottle tube, made wholly of gum-elastic, with a valve, and cemented to the bottles, is an additional recent improvement. The cost of canteens, hot-water bottles, and other flexible kinds, may also be much reduced through their manufacture by machinery, after the manner of air-work, described Vol. I., page .

HOT-WATER BOTTLES.

Are manufactured of unvulcanized fabrics, with a large tube of artificial ivory, and India rubber bottle-stopper. They are intended to be used in cases of sickness to give warmth to patients, or for travelling in cold weather, but may also be used for other purposes. These bottles are unquestionably among the most convenient and effectual means of applying warmth to patients in the hospital and sick room, or for the service of those who suffer from coldness of the feet.

IMPROVED HOT-WATER BOTTLES.

Are made of unvulcanized fabrics, like other hot-water bottles, with the addition of a tunnel made of caoutchouc fabric, attached to the neck, in order that they may be filled conveniently on all occasions, without the use of a separate tunnel.

They are also made with partitions, like some kinds of air-work, in order to keep them in the shape desired. Some of the various patterns are represented by figs. , plate .

SHAVING BOXES.

Most persons who use shaving boxes are aware that some improvement is needed in them, especially for travellers. When

made of wood the lids warp, and it is very difficult to keep them on; metal boxes corrode; glass and china are heavy and brittle, and have the same defect as the wood, from the looseness of the lids. Gum-elastic whalebone is recommended for this use, for the reason that it is not injured by hot water, will not warp like wood or corrode like metal, will not break like china or glass, and admits of the box being made water-tight by screwing on the lid.

DRESSING BOXES.

Superior boxes of this sort may be cheaply manufactured from caoutchouc ivory, instead of fine wood, and when it is desired they can be made with a soft surface of artificial gum-elastic upon the ivory, to make them resemble such as have commonly been covered with morocco.

PORTABLE DESKS

Are manufactured upon forms or in moulds of caoutchouc whalebone. On account of the lightness, hardness, and strength of this material, it has the same general recommendations for portable desks, that it has for the shaving and dressing boxes before described.

POCKET INKSTANDE.

A useful and curious pocket inkstand is manufactured of gum-elastic, with a gum-elastic ivory screw stopper and valve. See plate , fig. .

EXPANSION TRUNKS AND VALISES.

Trunks and valises of a pattern which has sometimes been made of leather, are now made of caoutchouc and whalebone board with new facilities, the material retaining its shape much better than leather. The trunk or valise is made in two parts, of about the same depth. That part which forms the top, and is a trifle the larger of the two, shuts over the other, and by being raised or depressed, the size of the trunk is proportioned to its contents. See plate , fig. . These are easily made a life-preserving apparatus when manufactured with a cushion of gum-elastic sponge around the edge of the lid upon the inside, so that when the trunk, valise, or box is reduced to its smallest dimensions, and the edge of the lid shuts against the cushion, it is rendered quite water and air-tight. See plate , fig.

In the application of gum-elastic to traveling apparatus, an improvement is made by a method of marking and numbering the articles, which adds greatly to their security against mis-carriage and loss. This, in the present mode of traveling by railway, is no inconsiderable advantage. The impossibility often of getting baggage checked for want of time, renders every precaution necessary.

The improvements consists in manufacturing the article with mottoes and numbers in bas-relief, selecting a different motto for each size of each class of articles, and a different number for each article.

This method of marking adds nothing to the expense of the articles, the mottoes being moulded in the process of vulcanizing, while much is added to their value by being rendered less liable to loss.

CHAPTER XXIX.

LIFE-PRESERVING TRAVELLING APPARATUS.

Life-preserver trunks. Improved life-preserver trunks. Water and air-proof valises. Water and air-proof hat and bonnet boxes. Travelling bags. Life-preserving travelling bags. Double life-preserving travelling bags. Life-preserving expansion trunks and valises.

A VARIETY of articles for the preservation of life have been treated of under the head of Air-work, but the design of the author in this place is to call the attention of the reader to that class of India rubber goods that may be used for different purposes in travelling, as well as for the preservation of life and property.

The defects of life-preservers inflated with air have been noticed in a preceding chapter; the advantages to be derived from the improved construction of different kinds were also noticed, and the inference was drawn that, notwithstanding all their objections, much good might yet be derived from the use of life-preservers inflated with air only, although some of the other kinds described were much to be preferred for safety. Whatever doubts may arise as to the comparative utility of any of the life-preservers before treated of, none need to exist as to the value of those which may be used for travelling purposes at the same time. Articles which are deemed, on the whole, of importance, not only for the purposes of travelling, but also as life-preservers, are here noticed. Notwithstanding it seldom happens that one article can be made to answer perfectly two distinct uses, an exception to this rule is claimed for the whole class of articles described as life-preserving travelling apparatus. Most of them answer two or more useful purposes, without objection.

For ordinary life-preservers there is but occasional use. For trunks, valises, carpet bags, and other travelling apparatus which may be made available as life-preservers, there is constant use. The importance to the public, however, of every improvement, depends upon the comparative cost of the article improved. The cost of most articles of this kind of travelling apparatus is not increased by the improvements suggested, except in the case of paper-boxes; and these are so much improved, that no comparison whatever should be made between them and those that have formerly been in use.

The expense of most of these articles is very much less than that of those heretofore used for the same purposes, and for some of the more expensive articles, the cost is lessened one half. This is the case with the trunk, hat-box, and other travelling apparatus, that are designed as substitutes for those which have heretofore been made of sole leather. The adaptation of these articles to use as life-preservers, does not render them any the less, but rather the more, useful for the purposes of travelling. Various expedients are devised for making them perfectly air-tight, which are cheap, simple, and effectual.

Some effectual means of closing the mouth of bags, for inflating air-work, and also for rendering gum-elastic trunks and boxes water and air-tight, were required in order to make them complete for these purposes, or at all infallible as life-preservers. These means have been effectually provided. The gum-elastic *self-acting valve* tube for inflating life-preservers, buoys, and other air-work; the cushioned clasp and jaws, and also the slide, for securing the mouths of bags, together with the groove and cushion, for rendering boxes and trunks water and air-tight, have been satisfactorily tested, and found unobjectionable for accomplishing the object.

To perfect these, although so simple and effectual when done, has caused much perplexity and great expense to the writer; and it is worthy of remark, by way of illustrating the general applicability of gum-elastic to useful purposes, that this object has only been attained by resorting to the vulcanized fabrics,

sometimes in combination with metal, but in most cases alone. These contrivances are as admirably fitted for closing the apertures of the different articles, as the fabrics are for rendering the body of them water and air-tight. It is important for many reasons that trunks and boxes which are used for containing clothing, should be tight, for standing in the house, as well as on ship board, and should have water-proof and durable covering, for some dwellings even, especially in new settlements, are not water-tight, and articles are exposed to be damaged in them, unless they are kept in trunks or boxes that are water-proof.

It is always desirable that both dust and dampness should be kept out of trunks and boxes that contain wearing apparel, because in travelling, the damage to clothing is often very great from dust, as well as from exposure to the damp salt atmosphere, to say nothing of storms by sea and land. This damage is effectually guarded against by the improvements in travelling apparatus. The exclusion of moths, without the use of articles that are offensive in clothing, such as tobacco and camphor, is another important advantage to be gained by the use of trunks, boxes, and bags of this kind. The incompressible bag is an improvement exactly suited to the rapid travelling of modern times. A very portable and flexible article of this kind answers the purpose instead of heavy trunks, to carry small and light articles, which are exposed to be broken and damaged. It may be used also for a pillow, cushion, or foot-stool, without materially injuring it, or exposing the contents to injury.

The arrangement of these different articles, when used as life-preservers, may be more easily pointed out, and made more apparent in the descriptions of the particular articles.

They may be considered perfectly safe as life-preservers, and although not so easily secured or bound to the person, they may be easily held on to, and easily attached together, to form rafts, or lashed to boats, so as to form life-boats of any wooden boats, although leaky. In order to impress the reader with the idea of the security of these articles, in comparison with those that

are inflated with air, some remarks upon the buoyancy of different articles may here be made.

It is generally supposed, at any rate it is the first impression of most minds, and even of a great portion of those who are well educated, that in order that an article may be sufficiently buoyant to answer the purpose of a life-preserver, it must be inflated with air, and must be so tight that the air cannot escape; whereas if the sides of the article are kept distended, it may be very leaky, and it will yet be a great length of time before it will become unsafe, when otherwise it would collapse and allow the wearer to sink instantly, if the sides were not kept distended by some resistance greater than the pressure of the water without.

The force of these remarks may be illustrated by a barrel with the bung out, or a demijohn with the cork out, both of which it is extremely difficult to sink in the water when they are empty, even when it is intended to do so. In most cases these articles will be quite safe as life-preservers, even if the article is not perfectly tight; in other words, a small leak, that would cause an article inflated with air to collapse and sink immediately, will not affect the safety of these articles in the slightest degree.*

The weight that will be sustained in the water by any of the articles hereafter described, may be certainly known by its cubic measurement, allowing sixty pounds to the cubic foot, and deducting the weight of the article; that is to say, a trunk or valise weighing ten pounds, and measuring two cubic feet, will sustain an extra weight of one hundred and ten pounds in the water.

It is well known that the specific gravity of the human body is less than that of water, and that it will not sink by its own weight, but it requires a buoyant power which is equal, for the average of persons, to about nine pounds. In other words, any article that will keep afloat a lead weight of nine pounds, will sustain a person in such a position in the water that he will be safe from drowning; but to make a more liberal allow-

* See Reports, Chapter , page .

ance, the estimate would be better made at fifteen pounds for each individual; consequently, a person travelling with a trunk measuring three cubic feet, allowing thirty pounds weight for the trunk, would take safely on shore one hundred and fifty pounds weight of gold, or other valuable property.

The proofs, with regard to the facts here stated, are ample, and the arguments should be conclusive; but the most important theories may be well established, and yet remain practically unknown, owing to the difficulty of making that which is clear to the inventor, intelligible to practical operators, and to those who execute the designs of inventors, so that they may safely co-operate with him to produce the thing desired. It is believed, however, that such a difficulty will not long exist on this subject, but that the specimens which have been made by the writer so demonstrate the utility of the articles, that they will, ere long, be brought into general use.

LIFE-PRESERVER TRUNK.

That represented by fig. 1, plate , is a cheap kind of water-proof trunk. The frame or box is made of wood in the usual manner, and covered with gum-elastic vellum or vegetable leather. A groove of about half an inch in width is cut in the wood in the top edge of the trunk. This groove is filled with a gum-elastic sponge cord. The hinge of the trunk is made of gum-elastic stayed fabric, about two inches wide, extending the whole length of the trunk. Elastic buckle straps, such as are described on page , are used instead of leather. When these are drawn tight, the trunk is made impervious to air and water, by means of the gum-elastic sponge cord inserted in the groove.

Another method of making the trunks water and air-tight, is by a cushioned lid, both in the top and bottom of the trunk, as will be easily understood from the plate , figs. 1 and 2.

IMPROVED LIFE-PRESERVER TRUNK.

The method of rendering these trunks water and air-tight, is very similar to that used for the wooden trunk before described. Being made upon an iron frame instead of wood, the cushion is either fastened upon the top of the frame, or secured in a groove as represented, plate , fig. .

The body of the trunk is formed of caoutchouc whalebone or board, wrought and cemented together so as to be as light and strong as possible. This may be considered as one among the most important applications of gum-elastic, on the score of economy as well as utility. The saving of labor when compared with the all-leather trunk, for which they are intended to be substituted, is greater than in most articles of gum-elastic, except shoes and some parts of harness.

A common sized trunk of this sort, measuring three cubic feet, allowing thirty pounds for weight, has buoyancy sufficient to sustain one hundred and fifty pounds of baggage, so that they may serve not only all the purposes of a life-preserver, but at the same time will carry safe a large amount of specie or other valuables. A number of them lashed together will form a safe raft, or if lashed upon the outside of a boat, will make it perfectly safe for a much greater number of persons than it would otherwise carry; and even if the boat is staved or broken, it may be made a perfect life-boat by lashing these trunks in it. This, like the one well known as the all-leather trunk, has the least weight combined with the greatest strength. The expense of the all-leather trunk has been a great hindrance to its general use, but the substitute here proposed, will probably be afforded at a much less expense than that has heretofore been.

WATER- AND AIR-PROOF VALISES.

These do not require description further than has been given of trunks of a larger size, except that being smaller they may be

made without iron frames, or may be made in moulds like hollow-ware. When made wholly of gum-elastic materials, being water and air-tight, they are equally useful in proportion to their size for life-preservers, and are more readily kept at hand.

WATER- AND AIR-PROOF HAT AND BONNET BOXES.

The improvements which have been suggested for the manufacture of trunks and valises, are equally applicable to hat and bonnet boxes, and the same advantages may be derived from their use in the same way. For no article is a cheap and substantial water-proof substance, instead of paper, more needed than for band-boxes. For this purpose India rubber whalebone or whalebone board is unquestionably *the* thing required.

TRAVELING BAGS.

See Chapter ,—Traveling Apparatus.

LIFE-PRESERVING TRAVELING BAGS.

There are different ways of securing all the mouths of the water-proof bags that are noticed in this work, so as to make them air-tight, in which case they may, any of them, be used as life-preservers. The kinds which are most safe, and are most highly approved, are of very nearly the same construction as the one noticed as an improved traveling bag, page 350. They are made more complete by an improvement on the slide fastening, by the addition of two or more clamps, with thumb screws. There is also a self-acting valve tube cemented in this bag, by

which it is inflated with air, although when vulcanized on forms they retain their shape so as to be self-inflated sufficiently for safety.

They are manufactured from a variety of the gum-elastic fabrics combined. See plate , figs.

DOUBLE LIFE-PRESERVING TRAVELING BAGS.

This bag is constructed from two bags of very nearly the same pattern as the one last described. The two are united together at the bottom, and are laced or buckled at the sides, as represented, plate , figs. ; each bag is made air-tight by a separate slide. When laced together, a third compartment is formed for the reception of coarse articles, boots, shoes, &c. When unlaced, it may be used as a life-preserver, and is the most convenient article of this sort for holding one up in the water.

LIFE-PRESERVING EXPANSION TRUNKS AND VALISES.

These are manufactured in the same manner as the expansion trunks and valises described in Chapter XXVIII. A spring of elastic compound is inserted in the straps, by the elasticity of which the two parts of the trunk are drawn together, and the trunk made water and air-tight by compression against the sponge in the top of the lid.

CHAPTER XXX.

ARTICLES FOR THE PRESERVATION OF LIFE AND PROPERTY.

Fire escape rope. Package envelopes. Fruit package envelope. Improved fruit package envelope. Portable boats and pontoons. Portable boat. Portable folding boats. Portable life-boats. Self-inflating portable life-boats. Tubular portable life-boat. Folding frame boat. Box-boat. Bateaux and canoes. Mattress boat. Self-inflating pontoons. Self-inflating pontoon raft. Self-inflating wagon floats. Self-inflating balsors and life spars. Life buoys.

MOST articles made from these fabrics may come under this head, as in some way tending to this object,* but reference is here made to such as are designed for the preservation of life and property in a manner different from those described in the preceding chapters; viz., such as are used by individuals. Those here treated of are such as may be used for the preservation of the lives of numbers, and for the protection and preservation of provisions and property in commercial transit. All these, together with the others alluded to, are deemed worthy the notice of those who risk, and also of those who insure, property for transportation by sea, and equally so of those who risk or insure lives on the water; as well as of the philanthropist who feels an interest in the progress of improvements, whether he has any pecuniary interest in them or not.

The preservation of life and valuable property on the water, is not now so difficult to accomplish as has heretofore been supposed, nor can a correct idea be formed, from the present prices of articles of this sort now in the market, at how cheap a rate

* Under the above head may very properly be included almost the whole class of articles described Chapter , Medical and Surgical. Some of these are too seldom wanted by any one individual, to warrant the expense of being provided with them all. It may be hoped that the expense of these will in future be so reduced that hospitals at least, and that families may in general have them.

they may be furnished when the manufacture shall be extensively engaged in, with the important improvements in the construction and fastenings of these articles. The personal efforts of the inventor have long been directed to this class of articles, and those connected with the cause of education; and it is his intention to continue them until the usefulness of the articles is so far demonstrated, that others shall duly appreciate the subject.

A suggestion has before been made, that the importance of this subject demands there should be some public or individual philanthropic enterprise engaged in, with ample means for the supply of an assortment of such articles on the lowest possible terms.

To the description of articles which follows, a catalogue of others is added, with reference to their place in other parts of the work.

FIRE-ESCAPE ROPE.

The design of a rope constructed as here described, is to extricate persons from the upper stories of buildings on fire. They are made as represented in plate , fig. , with a cross rope and handles, in order that after the rope is secured and passed from an adjoining building, persons may pass from one building to the other, or descend to the ground; or they are made without handles, like the gymnastic rope hereafter described.

The improvement which is made in this article, consists in inclosing the common hemp rope within an elastic hose, which being loose and stretching upon the rope, it allows one to descend easily upon it without chaffing or burning the hands.

PACKAGE ENVELOPES.

Envelopes have already been noticed in another chapter, as useful in certain cases for the protection of papers. That which is of more general utility, is a water-proof envelope for the safe transportation of merchandize and provisions, especially of those that are perishable, such as flour, fruits, sugar, salt, &c. In consequence of the recent invention of plated canvas, and plated coarse bagging, by the method described, Vol. I., of this work, chapter , it has become practicable to make envelopes so cheap for such purposes, that it is believed this will be found to be one of the most useful applications of gum-elastic.

The cheapest of these envelopes made of coarse canvas or bagging are plated or coated only upon the inside in this way. The wear is thus brought upon the outside of the bagging, which serves to protect the water-proof coating upon the inside from damage. An inner apron or mouth, made of a lighter gum-elastic material, is cemented at the top upon the inside of the envelope. This apron or mouth being tightly fastened, will exclude all wet or dampness. One great economy in the use of such envelopes in addition to their close stowage for shipping or transportation, consists in their adaptation for use a great number of times, for the same or for different purposes, on which account they become valuable to purchasers at retail, either for sale or for use, instead of being wasted or burned, as is often the case with cheap barrels and boxes. See Chapter fig

FRUIT PACKAGE ENVELOPE.

These are made from heavy plated canvas for the same purposes as the envelopes before described. They are intended not only to protect their contents from damage by wet, but also to

preserve fruits and other perishable articles from decay. For this use the air must be exhausted from them by means of an air-pump, a tube being attached to them for this purpose. An iron rim is also attached to the mouth of each part of the envelope, one or both of which has a soft gum-elastic packing cemented upon the edge of it. When the contents are of such a kind as to be liable to injury, from atmospheric or other pressure from without the envelope, it becomes necessary to keep off this pressure, by first placing the contents in a strong box or barrel, or they may be protected by an iron frame within the envelope. See plate fig. . .

IMPROVED FRUIT PACKAGE ENVELOPE.

This is made for the same use as the one above described, and in the same way, except that the package is made to fold like self-inflating air work, and is so constructed as to keep pressure off the contents by means of rims or discs of iron or whalebone board cemented in between the section, and by supports or braces, which prevent the envelope from collapsing in the other direction. See plate , fig. .

PORTABLE BOATS AND PONTONS.

Boats were among the first things that were attempted to be made of India rubber, not only in the United States, but also in Europe. But so far as the writer can ascertain, the experiments for this purpose have been chiefly confined to bags of air of various forms. Among these may be noticed the ponton made first for the United States Government, by the Roxbury Company, in 1836, of unvulcanized gum-elastic, and a considerable number made of vulcanized gum-elastic in 1847, which

were intended to be used in the Mexican Campaign. The first manufacture, as might be expected from the nature of the gum, was unsuccessful, and the practical utility of the latter, which were made to be filled with air only, may be considered equally doubtful.

Different attempts have also been made to make portable boats with folding wooden frames of various kinds; but none of these seem to have succeeded further than as curious specimens, or so far as to be used to any considerable extent.

A good portable boat, and particularly one that shall form a life-boat, is obviously a thing much needed. In portable boats savage tribes seem to have succeeded far better than civilized nations. The skill and ingenuity displayed by the native Indians of North America in the construction of the birch canoe may well claim the admiration of the best boat builder, and what is more, this canoe answers perfectly to his wandering propensities. A perfect model for speed, it is so strong that it will carry him over rivers, and lakes, and rapids, with its heaviest ladings, and yet so light that *he carries it* around dangerous rapids and falls, or from one river to another, apparently with as little effort as the bark carries him when launched. His skill in managing these canoes is even more surprising than that which he displays in building them. While they are so buoyant and unsteady as to render it unsafe, even with the greatest caution, for the most experienced seaman who is unacquainted with them to enter one, yet under the elastic step, and artfully-plied paddle of the Indian, it is controlled and moved with astonishing swiftness, as steadily as the sailors long boat.*

Little less deserving of notice is the boat made of skins by the Esquimaux of Labrador, which answers his purpose equally

* This fact is strikingly illustrated in the porpoise shooting of a tribe of Naragansetts at Eastport, Maine. They will shoot with the rifle and take into their canoes, in a rough sea, a number of porpoises weighing hundreds each. The fish sink so soon after shooting that no white man can perform the feat of reaching one in time, to say nothing of shipping him into a birch canoe. The Indians hunt these fish in summer, for the oil which they often exchange with their white neighbors for dried codfish in winter, when with the same amount of labor they might catch twenty times the quantity of fish with the hook. The same preference for hunting, leads them to spearing salmon at night, instead of catching fish with the hook, an occupation which they are said to despise.

well, not only as a boat but as a life-boat which he so much needs. That so little has been done in this art by civilized nations, would seem only to be accounted for by the fact that their rivals were so far in advance, as to baffle their attempts to equal them, or that they have not had the material suitable to build with. Considering the suitability of vulcanized fabrics for such purposes, and the improvements of the writer and others, in the construction of the boats hereafter noticed, it may be hoped that better success will attend this manufacture in future; and it will be little to the credit of the India rubber manufactories, if they are not able to make better portable and life-boats than have yet been built. A few only of the various kinds which may be made of these materials are here noticed.

PORTABLE BOAT.

A very light and strong portable boat is made from India rubber whalebone board in sheets, in the following manner. The sheets of board are cemented together upon a model or form of the shape required. It is next taken off, and placed inside another model of the same shape, in which it is vulcanized. The knees, gunwale, and braces are made of wood or iron covered with caoutchouc whalebone, and are cemented in before vulcanizing.

PORTABLE FOLDING BOATS.

The portable folding boats that are deemed most deserving of notice, are the two following, as represented in the plate , figs. 1 and 2. The plan upon which these two are made is very similar, but they are folded together in different ways. That represented by fig. 1 occupies, when folded, less space in length than No. 2, but more in thickness. The covering of them both

is made of plated canvas. The ribs or knees and braces which are made either of iron or wood, covered with caoutchouc whalebone, are cemented to the boat cover upon the inside. The ribs or knees are kept in place when the boat is opened by braces extending from one rib or knee to the other, and also by a keel-piece in the bottom of the boat. The ribs, keel, and braces of the boat, which are represented by fig. 2 are cemented on the inside of the boat in the same way as those of fig. 1, but they are made to run longitudinally with the boat; when folded, the ribs fit one within the other, so that this boat occupies a smaller space in thickness than fig. 1; when opened, the ribs are supported by braces extending from the keel to the gunwale.

PORTABLE LIFE-BOAT.

The portable life-boat represented by fig. , is made of caoutchouc whalebone board, and constructed in the same way as the ship's boats described in Chap. ; the gunwales, ribs, and seats being made of tubes or cylinders of whalebone board, of such dimensions as will render the boats more or less buoyant in proportion to their size. Compartments of the same material are made in the bow and stern of the boat, air-tight. The keel is also formed of a cylinder, so arranged that it may be filled with water, to give ballast to the boat, and pumped out when necessary. See plate , fig.

SELF-INFLATING PORTABLE LIFE-BOAT.

These are also of two kinds, resembling each other as the two portable boats before described. They are, in fact, the same boat, with the addition of a tube or air-chamber made of plated fabrics, between the knees or ribs of the boat. Instead, however, of the ribs or knees being made of iron or wood, they may be dispensed with by making the divisions between the tubes or air-chambers of caoutchouc whalebone, of sufficient strength to

keep the boat firm without other ribs ; each of the air-chambers is inflated by a separate tube, and upon being distended, the whole boat is self-inflated, and is prevented from collapsing, in the same manner as the other self-inflating air-work pontoons, life-buoys, &c., which are stayed by whalebone board between the compartments. See plate , figs.

TUBULAR PORTABLE LIFE-BOATS.

Tubular portable boats and life-boats, represented in plate , fig. , are formed of tubes, from one to two inches in diameter. These tubes, which are made of whalebone board, are cemented together lengthwise upon a model of a boat, after which they are stayed, finished, and vulcanized in another model, in the same manner as the ship's boats described, Chap. . These boats, in consequence of each tube being made separately water-tight, are more safe as life-boats, besides being stronger than those made of sheets of whalebone, although not so light and portable.

FOLDING FRAME BOAT.

This is a form of boat, the frame of which is made of wood, united by joints and hinges, as represented by plate , fig. . The cover, which is put on and off as required, is made of plated gum-elastic canvas. It is light and convenient, but somewhat objectionable, chiefly on account of the number of pieces and joints in the frame. It is rendered a safe boat, or life-boat, by air-chambers cemented to the top of the cover. See plate , fig.

BOX BOAT.

This boat is made of caoutchouc whalebone in two equal parts, which may be connected by hinges and shutter bolts. When shut together, they form a serviceable box or trunk. See plate , Chap.

BATTEAUX AND CANOES.

Batteaux and canoes of different forms, made of caoutchouc whalebone board, are both light enough to be portable and strong enough for common use. They are constructed upon the same general plan as the other boats before specified, which are made from caoutchouc whalebone and whalebone board, in sheets. See plate , fig. .

MATTRESS BOAT.

The mattress boat is one which, when folded, forms a good ship's mattress, and has been noticed as such, Chap. , p. .

SELF-INFLATING PONTOONS.

These were among the assortment of articles that were exhibited at the London World's Fair of 1851, for which a council medal was awarded to the writer. It is a kind of pontoon before alluded to as being an improvement upon those filled with air only. They are made of plated canvas, and are commonly about fourteen feet in length and eighteen inches in diameter, being made either round or square. Each pontoon is composed of from twelve to eighteen separate chambers or compartments, each of these chambers is self-inflated by a separate tube or orifice. It is inflated simply by pulling the ends of the pontoon apart; a sheet of caoutchouc whalebone board, of the size of the pontoon, is cemented in between every two compartments. These boards serve to keep the pontoons from collapsing, and when fitted for use they are prevented from collapsing lengthwise, by a spar fastened upon each one or between every two pontoons, when used in pairs.

The construction of these pontoons is such, that they will not collapse or be rendered unsafe in consequence of a leak, unless it happens to be a large one upon the water-line; neither is it indispensable that the tube or orifice should be stopped, in order to keep them inflated. See plate , fig. .

SELF-INFLATING PONTOON RAFT.

This raft may be formed from any description of air cylinder represented in plates , figs. . But the kind which is decidedly best adapted for this use, is the self-inflating pontoon described in this chapter.

In order to form one of these rafts, two of these pontoons or balsors are inflated and kept distended by a spar between them, to which they are fastened at each end. They are kept at any suitable distance apart by a transverse spar at both ends of the raft.

An India rubber canvas is drawn under them, which enables them to carry a large freight in smooth water without danger of its being wet; or, if the canvas is made larger, and is allowed to fall far below the cylinders, the raft will float a much larger freight or a much greater number of persons safely, in proportion to the bulk of the freight.

Rafts of this kind may be recommended as the surest and most economical means of saving the greatest number of lives and the largest amount of property, in cases of accident so destructive to both, and so very frequent upon navigable rivers and lakes. They are not expensive, and occupy but small space—say three feet by six—for one large enough to save the lives of three hundred persons. They are extremely light. There is not the slightest danger of the cylinders collapsing, and they can be fitted for use and launched in two or three minutes, without difficulty.

SELF-INFLATING WAGON FLOATS.

The cylinders for these floats are made in every particular like the pontoons last described, and may be considered an improvement upon the wagon float invented by Col. Staunton, described page . So far as the security of the floats against collapsing, and the facility of inflating them are concerned, they are unquestionably an improvement. The method of attaching them for supporting the wagons is the same as with the plain cylinder.

SELF-INFLATING BALSORS AND LIFE-SPARS.

They are made in every respect like the self-inflating pontoons and other self-inflating articles, in which the compartments are prevented from collapsing by sheets of caoutchouc whalebone board cemented between them, each compartment being inflated by a separate tube. They are, however, made of smaller dimensions, or from eight to twelve inches diameter and from twelve to twenty feet in length. They are designed to be used as life-spars, or to be fastened upon boats to prevent them from swamping.

LIFE BUOY.

See Chapter XI.

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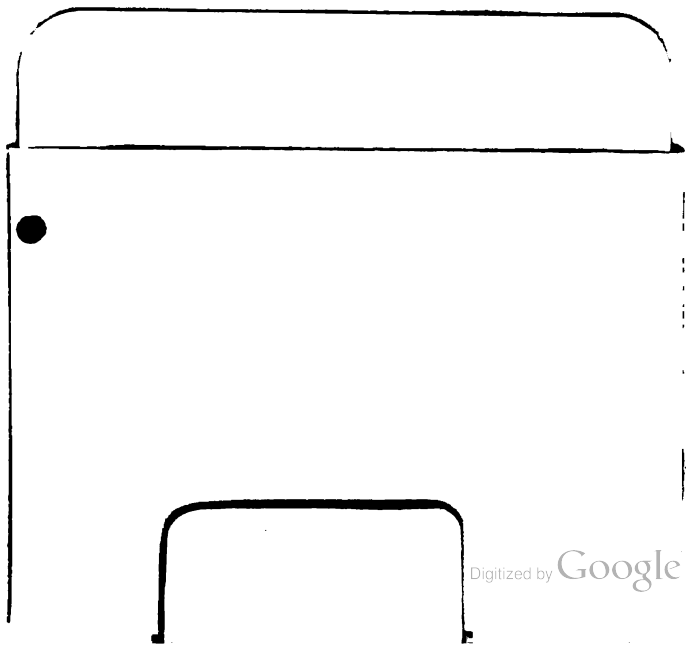
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